[From Fabricius d'Acquapendente: Opere Chirurgiche. Padova, 1684.]

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THE PHYSICIAN OF THE DANCE OF DEATH*

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Part II

THE PRE-HOLBEIN MANUSCRIPTS, BLOCK BOOKS AND INCUNABULA

A. Manuscripts

THE sources of the Dance of Death are to be sought in numerous manuscript didactic-religious Latin poems dating back to the beginning of the eleventh century. Of these the most significant are the various forms of the "Legende von den drei Lebenden und den drei Toten," which became the common property of all European Christendom, with its sepulchral cry of the dead to the living: *Quod fuimus, estis. Quod sumus, eritis.* In the twelfth century the English scholastic theologian, Walter de Mapes, related the legend in his "Lamentatio et deploratio pro morte." In the thirteenth century it was put into poetic form by Baudouin de Condé and Nicoles de Marginal. Soon it became a favorite subject of the illuminated manuscripts, and these in their turn inspired the creation of many wall and panel paintings, sculptures and reliefs. Of these the most celebrated is the fresco of the "Trionfo della morte" in the Camposanto at Pisa. From Petrarch's Triumphs came undoubtedly the idea of Mors Imperator, Death triumphant over all. Gradually the content of the legend became varied in many forms, and new features were added. Of especial significance for the evolution of the Dance of Death were also the manuscripts of the "Vision Fulbert's" and those of the Vado mori poems dating from the thirteenth century. The dialogue form of the Totentänze may very well have had its origin in the so-called "Conflictus" literature of the twelfth and thirteenth centuries, of which many examples are preserved in German, French and English manuscripts. One of the most popular of these was the Latin poem ascribed to Bernhard von Clairvaux, "Dialogus mortis cum homine," which had a great vogue in the Middle Ages, and was translated into German, French, English and Italian popular speech. It inspired the production of numerous poems and prose tracts treating the same theme in dialogue form, either enlarging on or specializing in certain of its features. To the "Conflictus" literature belongs also the fourteenth century manuscripts of the "Ackersmann aus Böheim," which was later printed by Pfister under the title of "Der Rechtsstreit des Menschen mit dem Tode."

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* Part I appeared in the July issue of the Annals of Medical History, p. 351.

The oldest manuscript dance of death is that of the "Dança general de la muerte," in the Escurial, and which for a long time was ascribed to Rabbi Santol de Carrion, about 1360, but which is now known from its form of versification to have been written early in the fifteenth century. It begins with the heading "Prologoen en la Transladaçion." In contrast to the general custom of writing rubrics in Latin, this manuscript was written in the common folk language of the time. It has no illustrations. It was undoubtedly the work of a priest, as the clerical series is represented in full. The verse is in the Spanish form "verso de arte mayor." It is very probable that the "Dança general" evolved from the primitive Montserrat dance of death song, "Ad mortem festinamus," but no intermediate forms are known to exist. A thorough search of old Spanish libraries and archives might throw some light upon this question. The manuscript of the poem consists of 79 strophes, preceded by a short prose prologue in which Death declares his universal power. After this speech, the Preacher in 3 strophes calls upon the Holy Writings to prove that all born of dust must die; after which invocation, Death calls to men of every rank and station in life to join "la dança mortal." Two young maidens are first invited, and after having being danced away by death, the dialogue between death and his victims begins with the Pope. Thirty-three orders of society are called by death, the clerical personages alternating with the secular. The physician has the eighteenth place. At the end death calls upon all of those whom he has not specifically named to follow in the dance. The importance of this manuscript poem in the evolution of the dance of death is very great. For the first time the human personages are presented with sharply-cut characterization, not as things or fixed types which suffer a common fate. They mourn, implore and beg for mercy; they call for help from their friends or dependents, or take a sad farewell from them. Coarse or humorous episodes are wanting; the poem expresses a serious ascetic-religious tendency in an earnest and solemn didactic style. Traces of the Spanish poem are found in the Paris Danse Macabre and in the old text of the Lübeck Totentanz, which undoubtedly was greatly influenced by the old Castilian poem. This is natural enough, when we consider that Lübeck, through the Spanish Netherlands held active commercial and artistic intercourse with Spain.

In the manuscript collections of the Bibliothèque Nationale in Paris there are several manuscript copies of the Danse Macabre of 1425. One of these (No. 7310.3) is a superb manuscript ornamented with illuminated miniatures; it contains the text of the poem printed with Marchant's edition of 1485. All of the others have the text only without miniatures. In Germany there are manuscripts containing Totentanz material preserved in many libraries; particularly is that of Stuttgart rich in the possession of a number. Munich has three manuscripts without illustrations; Heidelberg and Berlin each possess one.

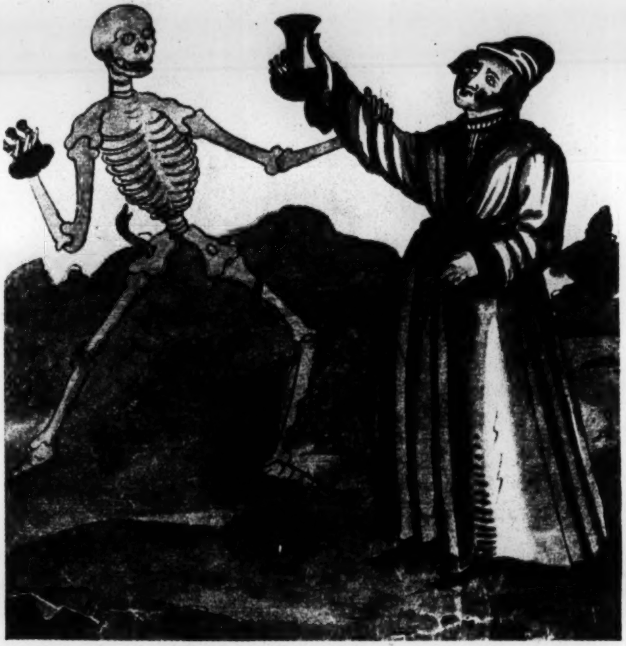


Fig. 11. Death and the Physician. From the Zimmern Totentanz Manuscripts of the 16th Century. Original in the Königsegg Library at Aulendorf.

To the sixteenth century belong the Zimmern Totentanz manuscripts decorated with artistic colored illustrations. They recall the Basel wall paintings in their general treatment. The death figures are partly skeletonized, partly mummified, showing but little knowledge of anatomy; and have worms, snakes, frogs, lizards and snails attached to their bodies. For the greater part they play upon musical instruments. The background shows trees, mountains, houses, castles, churches and cities, suggestive of the Schwarzwald region. The costumes are characteristic and appropriate to the individual depicted. The figure of the physician recalls that of "Der Doten Dantz," in its similar composition (see Fig. 11). The death holds the same musical instrument, a sort of clapper-castanet; serpents twine about the body. The physician wears a long tightly girdled gown with full skirt and wide sleeves. His shoes are pointed, his hair long and straight; he wears a high rounded cap, and has an ornamented collar or chain aronnd his neck. He has the characteristic pose of the urine-gazer, and is represented as a type, without individuality.

B. The Block Books

The oldest manuscripts of the Totentanz illustrated with woodcuts are the so-called Block Books of Heidelberg and Munich, dating from the first half of the fifteenth century. Before the invention of movable type, an attempt was made to print whole books by means of woodcuts having both picture and text cut in one block. Just when this attempt began is not known, but it is assumed to have been developed among the printers of picture cards illustrating the saints, holy festivals, popular legends or tales, playing cards, and the like. Originally, only an attempt at economy and the saving of time, this method of block printing was destined to evolve into the highest expression of book illustration. The majority of the block books preserved to us are roughly colored with washes of brown, yellow and grayish brown, while green and cinnabar were used to accentuate the printed line. Later, the art of woodcut book illustration sought to rid itself of the use of color, at first, probably from the standpoint of economy, later for pure artistic reasons. As books of the people, purely as picture books, the block books had a great popularity, and numerous editions were printed, until they were replaced by the typographic book. The Heidelberg block book contains colored woodcuts and a xylographic text; the Munich example has similar illustrations, but with a handwritten text. The texts agree in content and arrangement, but show dialectic variations and differences in the use of words. The artist of the Heidelberg book had undoubtedly seen the Klingenthal or the Basel wall-paintings, or both; there are twenty-six pictures, the "Prediger" and twenty-four pairs of figures, with the additional figure of death and the apothecary by an entirely different hand, and which appears in no other Totentanz. The page upon which this picture is printed shows much less damage from wear than the others; it must be regarded as a later addition to the original set. The Heidelberg woodcuts show the strong head and angular folds in the garments characteristic of the older art. There is no hatching or shading, and no indication of any background. The artist made use of the fewest lines possible. The death figures are shrunken mummified bodies with skeletonized heads having enormous lower jaws. The physician (see Fig. 12) is dressed in a flowing over-gown with ballon sleeves and tight cuffs over an ungirdled robe. He has a high, closely fitting collar,

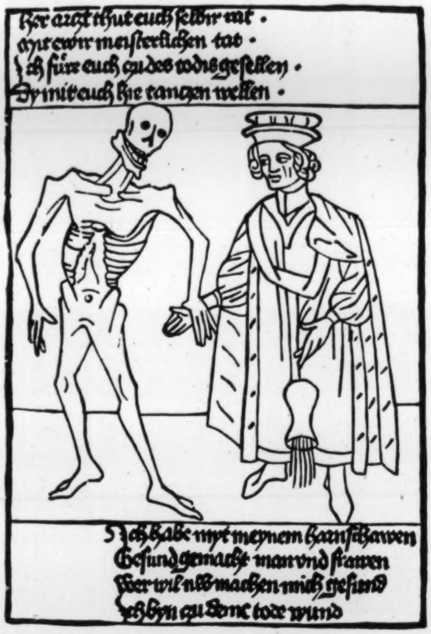

Her arczt thut euch selbir rat ·
Mit ewir meisterlichen tat ·
Ich füre euch zu des todis gesellen ·
Dy mit euch hie tanczen wellen ·
Ich habe myt meynem harnschawen
Gesund gemacht man vnd frawen
Wer wil nu machen mich gesund
Ich byn zu deme tode wund

Fig. 12. Death and the Physician from the Heidelberg Block Book. Early 15th Century. (After Massmann.)

and wears a flat double-crowned cap. He has short curly locks. He wears pointed shoes. His face is thin and rather ascetic. Death seizes him by his right wrist; from his falling left hand drops the urine bottle upside down, spilling its contents. He is the urine-gazer type of the old wall-paintings, represented in a cruder art-form. The artist of the Munich block book has abandoned the old dance form and represents simply the dialogue of man and death. The latter addresses his victims, gesticulates or threatens, while they appear resigned to their fate. They are also types, but represented with a touch of spirit and humor. The drawing shows strong feeling and sense of rhythm. In both block books the creative material is wholly that of the use of the line. Their significance for the development of the dance of death lies in their abandonment of the dance form for that of the paired dialogue, and in their simplicity of conception and treatment. They hold an intermediate position between the art of the wall-paintings and that of German book illustration.

C. THE DANCE OF DEATH INCUNABULA

The Danse Macabre and Totentanz imprints are among the rarest and most precious books of the incunabula period. So few are preserved in the great libraries of the world that they are not even mentioned in many of the catalogues of incunabula. No copy has come into the market for many years. This great rarity attests the great popularity of the various editions that were printed; the volumes were in all probability so much used that they were worn out. The imperfect condition of the few copies preserved to us bears out this assumption.

French Incunabula. The history of the French Dance of Death incunabula is chiefly that of dates of editions and the names of the printers. The first French book edition of the Danse Macabre, as has been stated before, is that of Guyot Marchant in 1485, which is apparently a faithful copy of the wall-paintings in the Cloister of the Innocents in Paris. Only one copy of this edition is known to exist, and this is preserved at Grenoble. The deaths and living figures are presented in double pairs in fifteen woodcuts, in frames of arches and pillars. The death on the left in each picture is paired with a representative of the clerical rank, the death on the right with one on the secular class. The left hand death in each case carries in one hand a scythe, spade, coffin-lid or spear; with his other hand he clutches his victim; the second death seizes the clerical individual with his right hand and the secular with his left, so that in each woodcut the four figures are united into a semblance of the "Reigen" form of the dance. The artist of the woodcuts held himself closely to his monumental model. His lines are coarse and the hatching simple. The figures stand quietly or show slight action; the expression of their faces is calm and composed. On the other hand, the movements and gestures of the deaths are more animated and lively, their positions angular. There is the barest indication of a landscape background in the form of little bushes and flowers. So popular, however, was this work that a second edition was brought out in Paris in 1486; and in the same year Marchant published a "Danse macabre des femmes." In 1490 two more editions of the "Danse macabre des hommes" were printed by Marchant, one of these in Latin, the "Chorea ab eximio macabro," purporting to be a translation from the German. In 1491, Marchant brought out another edition of the "Danse des femmes." In 1499, an edition combining both the dance of men and of women appeared in Lyons (see Fig. 13); and in the same year another edition was published in Paris of the "Chorea." In 1500 four editions of the dance of men were brought out in Paris, one each by de la Barre and the firm of Jehan Treperei and Jehan Jehannot, and two by Antoine Verard. (See Fig. 14.) Those by de la Barre and Verard contained also the "Le trois vifs et les trois morts." All of these were large or small folios, with the exception of a large octavo by Treperei and Jehannot. In the same year editions of the female danse macabre were published in Troyes, Rouen and Lyons. From 1501–1729 more than twenty editions were published (see Fig. 15), the great majority of those being of the "Danse macabre des hommes et des femmes"; and numerous reprints and facsimiles of the various forms of the "Danse macabre" have appeared during the last century, even to the present day.

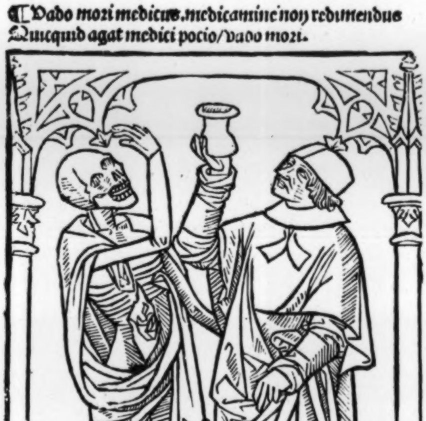

¶Vado mori medicus. medicamine non redimendus
Quicquid agat medici pocio/vado mori.

Fig. 13. Death and the Physician. From "Le grât dance macabre," Lyons, 1499. (After the Original in the British Museum.)

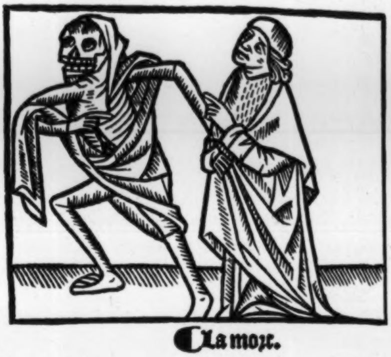


Fig. 14. Death and the Physician. From "La dance macabre," Paris, 1500. (After the Original in the British Museum.)

Books of Hours (*Livres d'heures*, *Horae*). After the publications of Guyot Marchant had appeared, various printers made use of the Danse macabre illustrations for the adornment of their magnificent prayerbooks, the books of Hours. These beautiful works with dance of death borders are among the most sought after and cherished by the collector of dance of death items, and are the most costly as well. Printed on parchment, they were richly ornamented and illuminated. The interesting and, to us, most fascinating subjects used for the adornment of the borders of these prayerbooks were taken from the histories of the saints, from mythology, the sibyls, hunting and pastoral scenes, fantastic conceptions, and above all from the danse macabre. In the dance of death borders sixty-six personages were often repeated over and over, usually one individual and one death in each picture. The style and treatment were essentially Gothic in spirit, and the text was usually beautifully illuminated with colors. The most renowned editor of these Gothic hours was Simon Vostre, who began his series in Paris about 1484, but did not use the danse macabre motive until about 1491. So successful and popular were these beautiful prayerbooks, and so great was the demand created for them in the whole of France, the Low Countries and in England, that from 1491 to 1519 Vostre put out forty-six editions. The great majority of these were printed by the printer Philippe Pigouchet. Naturally other printers followed with imitations, and in the last decade of the fifteenth century and the first half of the sixteenth a great number of editions of the same kind were issued. The most important of these were those of Antoine Verard (8 editions, 1497–1510); Jean Poiterin (1 edition, 1503); Thielman Kerver (5 editions, 1505–1531); Gilles and Germain Hardouin (3 editions, 1499–1520); Guillaume Godard (6 editions, 1510–1520); Jean Bignon (1 edition, 1521); and François Regnault (4 editions, 1527–37). Editions were also published at Troyes (in German, 1491); and in Lyons (1491–1521). Prayerbooks with dance of death borders continued to be printed until

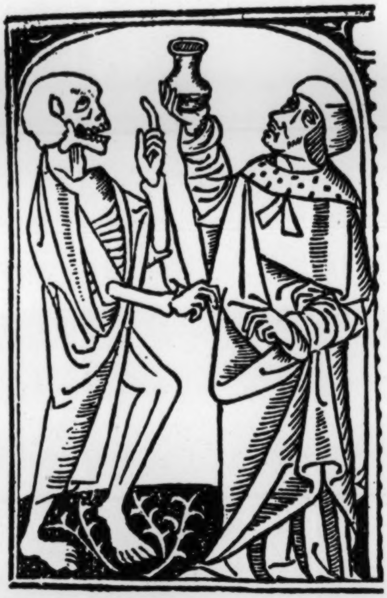


FIG. 15. DEATH AND THE PHYSICIAN. FROM "LA GRAN DANSE MACABRE," LYONS, 1555. (AFTER THE ORIGINAL IN THE BRITISH MUSEUM.)

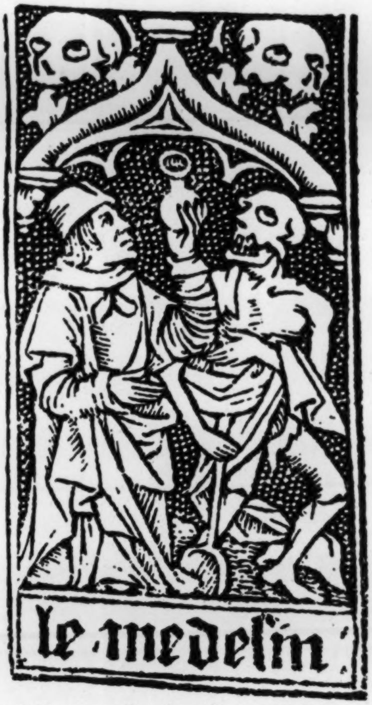


FIG. 16. FROM THE DANCE OF DEATH BORDER OF THE BOOK OF HOURS, 1490(?). EDITION NOT IDENTIFIED.

the middle of the seventeenth century, and reproductions have appeared within the last century. In this form of prayerbook ornamentation, rather than illustration, the invention of the artist was restrained by the religious-didactic considerations. Very little difference in style or treatment is shown in the different editions. They all follow the Gothic tradition of ornamentation and show a certain stiffness and coldness of treatment; the significance of the figures becomes lost in the confusing richness of decorative forms spread over the whole surface without strong contrast or effective silhouettes. The dark background behind the figures is dotted with white points, so that large white and black spaces are almost wholly absent. The three illustrations (Figs. 16, 17 and 18) give an idea of the slight variations in treatment of the Physician in different Vostre editions. The influence of the original Danse Macabre is evident. Under an arch decorated with skulls and cross-bones stand the Physician and Death, the former in the usual attitude and pose of the urine-gazer, intent upon his urine inspection, while death holding a spade grins at him.

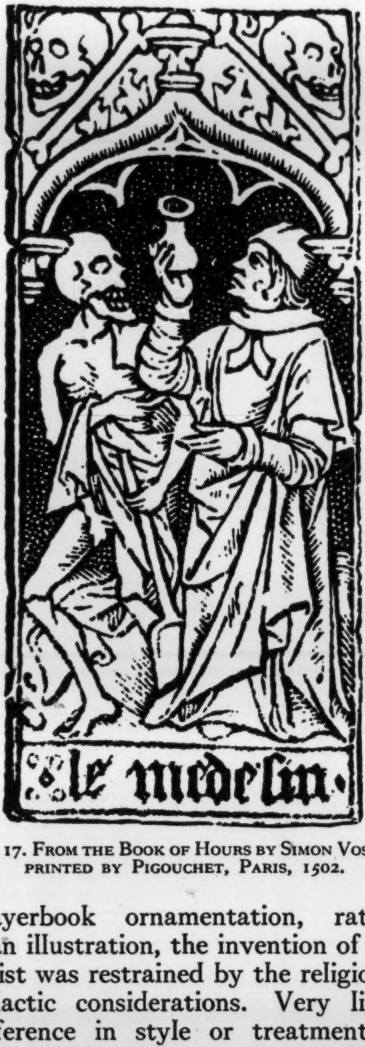


Fig. 17. From the Book of Hours by Simon Vostre, printed by Pigouchet, Paris, 1502.

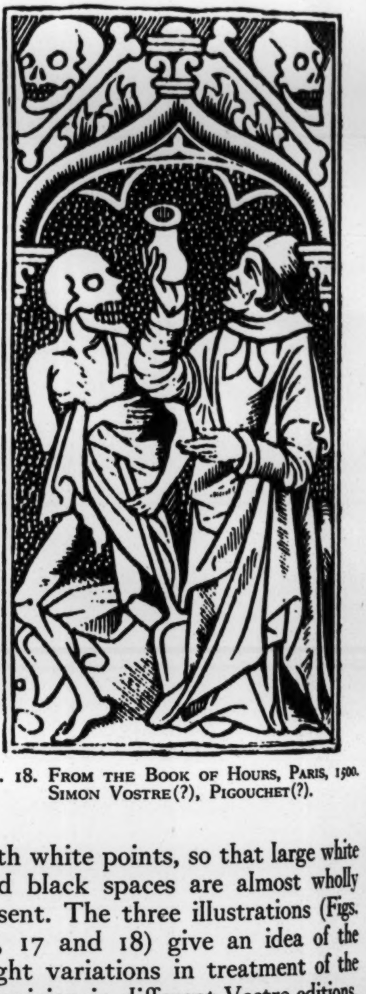


Fig. 18. From the Book of Hours, Paris, 1500. Simon Vostre(?), Pigouchet(?).

The woodcuts of the French incunabula of the Danse Macabre and of the Books of Hours had not the slightest influence upon the evolution of the Dance of Death motive. That evolution, as we shall see, occurred wholly through the development of German woodcut art, in which the dramatic element in the theme, the development and individualization of the single picture, the vitalizing of the material with spirit and humor showed a distinct advance in each new artistic creation; while the French Danse Macabre showed complete stagnation in all of these directions. It remained from first to last a constantly repeated copying or imitation of a stereotyped form untouched by the magic of creative genius and inspiration.

German Incunabula. The oldest of the German incunabula is the "Des Dodes Dantz," printed in Lübeck in 1489. Four editions of this are known, and of each edition one example only. The first edition (1489) is in the Germanic National Museum in Nürnberg; the second (1496) is in the Wolfenbüttel Ducal Library; the third (1520) is in the Bodleian Library in Oxford; while the fourth (1536) is in the Royal Library in Copenhagen. A facsimile reproduction was issued by the Graphische Gesellschaft in 1910. This was made from the copy in the Germanic Museum, with the exception of the sixth leaf, which the Nürnberg copy lacked, and which was reproduced from the second edition in Wolfenbüttel. It is in a different type. The second edition differs from the first in that two figures "Der Offizial" and "Der Narr" are added. The copy of the fourth edition in the Copenhagen Library is very much damaged, and appears to have several additional figures of inferior value. Single woodcuts from "Des Dodes Dantz" appear in other Lübeck incunabula: Death with the scythe in the editions of "Nauolghinge Jesu Christi" of 1489 and 1496; the Nun in "S. Birgitten Openbarringe" of 1496; and the Pope, Cardinal and Bishop in the "Speygel der leyen" of 1496. The Lübeck first edition probably owes its origin to the great popularity of the wall-paintings in the Marienkirche of that city; and the text of the book is undoubtedly derived from that of the paintings. Not so, however, are the illustrations. In the composition of the figures, their simple and significant disposition, and in the arrangement of death and his victim, facing each other and engaged in conversation, are to be found the elements of the new art of book-illustration. The older scheme of composition as shown in the wall-paintings, with the various human figures paired and dancing with the deaths, and forming a chain, is hereby abandoned. The artist of the Lübeck woodcuts, as is also the printer of the book, is unknown. Many hypotheses have been advanced connecting various artists with these woodcuts, but no one stands the test of critical research. The two coats of arms at the close of the book have not been identified. It is certain that the artist of the woodcuts of the Dodes Dantz is the same as that of the Lübeck bible of 1496, who seems to have been active in Lübeck for a long time, and to have exercised a great influence upon the art of that city during the period of his activity, particularly upon book-illustration. He is regarded as an original and free spirit, unhampered by conventionality, and was probably of foreign origin, possibly Dutch.

The woodcuts present twenty-eight

ranks of life, single individuals, each paired with a death, facing each other, and engaged in characteristic dialogue.

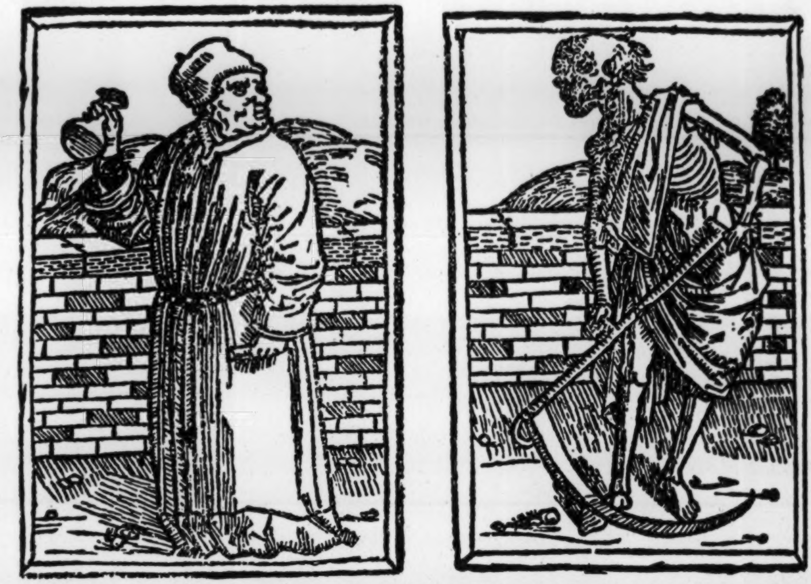


Fig. 19. Physician and Death. From the "Des Dodes Dantz," Lübeck, 1489. (After the Facsimile Reproduction of the Graphische Gesellschaft, Berlin, 1910.)

Besides these there are three single cuts, two of death as a grave-digger and one showing him with a scythe. There are only four figures of death, these two, and one representing him riding a lion and brandishing a sword, and the fourth in which he is holding a spear. These four death figures are used over and over in alternation. The physician is in the fourteenth pair, coming after the burgomaster. He is a stout individual with an unpleasant, rather impudent, sensual face. He is dressed in the girdled robe, wears a high cap with short tassel, and holds the urine bottle high in his right hand. Contrary to the accepted conventional figure of the physician in the wall-paintings, he is not looking at the bottle, but away from it, towards the death, who holds the scythe. Behind the figures is a neutral background, only slightly sketched, as that of the medieval stage, consisting of a brick wall, over which hills rise. The figure of the physician is one of flesh and blood, taken from the midst of life's activities, as are all of the personages representing the different ranks of society depicted. The woodcuts show much individuality of observation, power of expression and temperament; and are bound together by a lively dialogue, the speech of each living individual accompanying his picture, the answer that of the figure of death.

Besides the Lübeck Totentanz there are two other German illustrated dance of death incunabula, belonging to South Germany. The woodcuts are the same in each; both are undated, and name neither printer nor place of printing. Through a comparison of the type characters of "Der Doten Dantz mit Figuren, Clage und Antwort schon von allen Staten der Welt," it seems certain that the printer of the first edition (about 1490) was Heinrich Knoblochtzer von Ettenheim, who was active in Heidelberg from 1486 to the beginning of the sixteenth century. The second edition was printed by Jakob Meydenbach in Mainz, sometime between 1491 and 1495; and towards the end of the fifteenth century a third edition, or copy of the second, appeared. Of the three editions only a few copies are preserved: five of the first, and only three of the second edition. They are in the libraries at Berlin, Munich, Darmstadt, Karlsruhe, Wolfenbüttel and London, and the Kupferstichkabinett in Berlin. No one is wholly perfect; the copy in the Bavarian State Library in Munich is complete and hardly cut, but is lightly colored. Two reproductions of the "Der Doten Dantz" have been made: that of Wasmuth's Kunsthefte, in which thirteen of the cuts are reproduced from the original in Berlin; and the facsimile edition printed by Hiersemann of Leipzig in 1922. The original work has 44 pages, with 41 woodcuts and accompanying text. The first and the last cuts are nearly of full-page size; the others of half-page size. In the first woodcut four deaths sit on a table under a roof, three blowing musical instruments, the fourth directing their concert. In the foreground three skeletonized deaths dance about an open coffin in which a shrivelled corpse is lying. Then follow thirty-eight single dances of death. The final woodcut represents a churchyard scene in which the dead arise from the graves. There is a charnel house heaped with skulls. The text is arranged in two columns above the cuts; the first column contains the speech of death, while the second contains the answer of the human individual addressed. Both columns have large initial letters taken from older incunabula. The Pope leads the clerical row; after him follow the Cardinal, Bishop, Official, Domherr, Pastor, Chaplain, Abbot and the Physician. The inclusion of the physician in the clerical ranks follows the precedent set in the Paris Danse Macabre, and is probably significant of his origin from the priesthood. In the Lübeck "Des Dodes Dantz" the physician has the fourteenth place in the series; in the "Der Doten Dantz mit Figuren" he is advanced to the ninth place, following the Abbot, taking precedence of all other members of the secular class.

The Physician of the South German incunabula is attired in a loose, ungirdled robe, tightly fitting at the neck, and showing two large round buttons on the chest. The cuffs are fur-trimmed. On his head is the high rounded cap, and on his feet are pointed shoes. His long straight hair reaches to his shoulders. In his right hand he holds aloft the urine bottle; his left hand is extended and open. He is intently examining the urine through spectacles of the contemporary type astride the bridge of his nose. He appears to be a man in early middle age; the primitive woodcut betrays little facial expression, except in his lips, the lines of which give to his face a serious or critical air. The accompanying death is in a lively dancing attitude, holding in his right hand a musical instrument, a combination of castanet and clappers. Both hands and arms are raised aloft. In his body cavity a serpent is seen coiled, and another protrudes from his left orbit. A background of rolling landscape is barely indicated by a few bold lines. The verses attached to the woodcut, put into equivalent High German form, are:

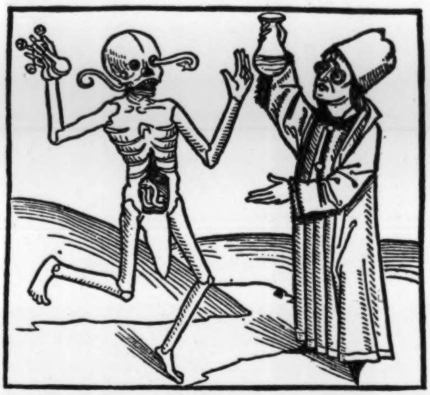


FIG. 20. DEATH AND THE PHYSICIAN. FROM THE "DER DOTEN DANTZ MIT FIGUREN, CLAGE UND ANTWORT." SECOND GERMAN EDITION(?). 1495(?). (AFTER THE ORIGINAL IN THE BRITISH MUSEUM.)

Der Tod:

Herr Arzt, Ihr könnt den Leuten wohl sagen,
Wie Ihr den Tod wollt von ihnen verjagen,
Könnt Ihr finden was wider den Tod?
Sucht's hervor, das ist Euch not!
Ihr habt andre Leute gesund gemacht,
Und Eure Seele gering geacht!
Wie mag Eurer Seele Rat werden!
Ihr habt gekürzet manchen sein Leben!

Der Arzt:

In aller Arznei konnte ich Rat geben,
Zu verlängern des Menschen Leben.
Nur wider den Tod, zu dieser Fahrt,
Finde ich kein Kraut, das mich verwahrt.
Ach, göttliche Barmherzigkeit.
Meine Sünden sind mir leid.
Deine grundlose Güte die gibt Vertrauen mir,
Weil all' mein Heil stehet bei Dir.

The verses of the first edition were written in the Middle Rhenish dialect. Whether originally composed for the Heidelberg edition is unknown. The eight-line strophe form shows that they belong to the latter half of the fifteenth century. They show evidences of various sources, particularly the text of the Paris Danse Macabre, from which whole lines have been taken almost word for word. The relation between poet and artist is very loose; the illustrator had read the verses, but used his own imagination in the woodcuts, so that his art is fresh and original, and not bound to mere reproductions of the text. Nevertheless, there is an artistic unity reached in both text and illustration, such as was rarely attained in printed book illustration. It is evident that the woodcuts represent the work of two artists, both unknown and forgotten. They mark the close of the period of the primitive woodcut. To one artist is ascribed the first twenty-six cuts; to the second the last fifteen. In the second edition this order was changed, and the work of the two artists mixed in order to bring about a sharper classification of the social orders represented. The Meister of the last fifteen woodcuts is by far the more important; in his work phantasy runs free and unchecked. On the other hand, the work of the artist of the first twenty-six cuts was influenced by older models. The gestures and poses of his human characters are quiet, almost monotonous, and show little evidence of the tragic moment. They accept their fate with stoicism or resignation. Their garments hang in heavy, almost unbroken folds. His death figures show greater activity; they are represented as partly mummified, partly skeletonized cadavers, betraying a lack of careful anatomical observation. They present usually an open belly-slit, with snakes or frogs in the body cavities. The general style suggests the contemporary dramatic form. His effects are achieved, not through perspective and plastic form, but through the contrast of surfaces, outlined with expressive contours. The reduction of the action to a two dimensional space, and the omission of non-essential details are contributing factors to the effect which these woodcuts make upon us. The artist of the last fifteen cuts was a master of the living line, through which he shows a temperament full of fire, spirit and invention. His deaths are also shrunken cadavers rather than skeletons; the belly-slits do not show in the majority, and are only indicated in the others. Five of them still have hair on their heads. Although the pairs of figures are monotonously arranged, the deaths always looking to the right and his victims to the left, the general impression is lively, and the interest concentrated upon the two figures which are presented with a tragic grotesqueness. Bizarre humor is mingled with the elements of horror, that borders upon the theatrical, but always showing a true artistic instinct. The spirit revealed is that of a Northern race, which found its highest expression in the *Imagines Mortis* of Holbein. A special unity of impression is given this dance of death by the various musical instruments which nearly all of the death figures carry. These constitute a veritable orchestra: flutes, shawms, trumpets, bagpipe, hand-organ, dichord and trichord, violin, cymbals, harps, mandolin, guitar, zither, drum, tambourine, bells, castanettes, clappers and triangles. Perhaps it was intended that the sound of the given instrument should indicate the character of the given individual; thus the death of the physician has in his right hand a combination of castanet and clapper, an instrument of noise rather than of melody.

Critical opinions differ as to the importance of the rôle played by the German incunabula in the development of the Totentanz idea. According to Goette the "Doten Dantz mit Figuren" does not follow any especial model, nor does it show any decided originality. He regards it as made up of reminiscences of the Danse Macabre, the Lübeck and Gross Basel wall-paintings and their texts, in which admonitions to repentance and threats of punishment for sin play the chief rôle; and, on the whole, of little importance in the history of the Totentanz paintings. On the other hand Bossert accords it great importance as a production of the dying Gothic period, as marking the close of medieval world-outlook and philosophy. Buchheit follows Bossert in his high estimate of its significance, and ascribes to it a greater degree of skill, winged phantasy and richness of style than that presented by any other single work of the medieval dance of death period. As far as its more immediate influence upon the Totentanz motive is concerned, the old "Reigen" of the wall-paintings is almost wholly abandoned in the incunabula, and the personification of death is wholly accomplished. The text says again and again "Ich bin's der Tod," or "Ich bin hier, der bittere, Tod." Death is represented as a ruling-power who works the will of God.

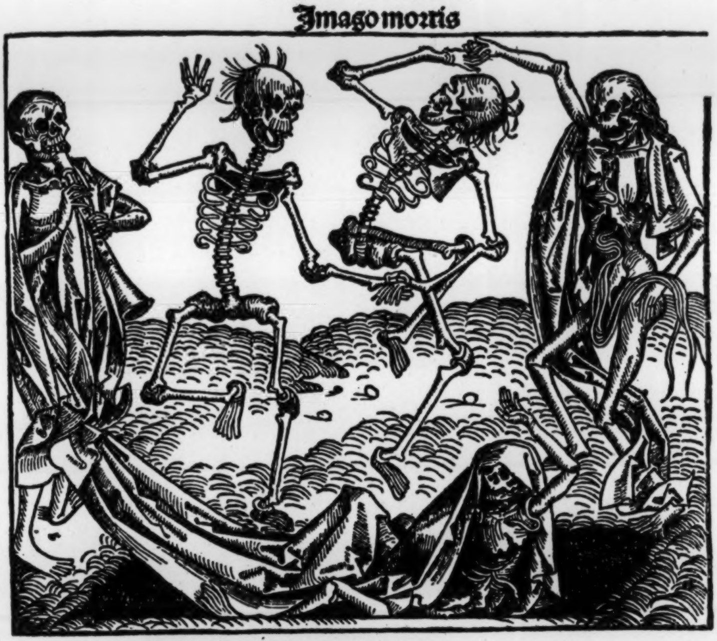
The second edition of the South German incunabula is known to exist in only three examples, those of Berlin, Munich and London. It is generally ascribed to Jakob Meydenbach in Mainz, whose dated works fall from 1491–1495. The woodcuts are the same as in the first edition, but, as mentioned previously, the order is somewhat changed. The initials are lacking in the text, and the cuts are not numbered; otherwise the second edition is wholly dependent upon the first. A complete copy of the pictures, after the lost Strassburg example, is found in Kastner's "Les Danses des Morts." At the close of the fifteenth century a third edition, copied from the second, was printed. No mention is made in the literature of the whereabouts of the examples of this edition, and no description of it apparently exists.

The bond between typography and book illustration was created about 1470, with the introduction of woodcuts into books printed with movable type. Albrecht Pfister led the way, almost a full decade ahead of all other printers in Germany, France and Italy. Among the great rarities from his press was the poem "Der Rechtsstreit des Menschen mit dem Tode," a version of the "Der Ackersmann aus Böheim," belonging to the "Conflictus" literature. After 1470 woodcut books appeared in constantly increasing numbers from various presses, particularly those of Augsburg, Ulm, Lübeck, Cologne, Strassburg and Mainz. Scattered through the woodcut books are numerous single prints dealing with some phase or aspect of the dance of death motive. The skeletonized personification of Death occurs in many of these, as in the woodcuts of the Meister von Zwolle (1480), and those of the Meister H. W. (1482), and in the "Le Chevalier dé libré" of 1486.

It certainly cannot be regarded as purely accidental that among the relatively few woodcuts of the early incunabula period, there should occur so frequently the representation of death. The early woodcut artists were all well acquainted with the churchyard motive, and undoubtedly responded to a popular demand for its illustration. As early as 1464, the "Meister mit den Bandrollen" produced a naive cut of a skeleton shooting at men sitting in the tree of life, the clerical nearer to heaven than the secular personages. In these cuts Death is usually represented as a skeleton form on foot or on horseback, with scythe, arrows, hourglass and other attributes. Among the most interesting of the incunabula woodcuts, in which this death motive is introduced, is one in the "Weltchronik" of Dr. Schedel, Nürnberg, 1493. The picture, most probably the work of Wohlgemuth, shows five deaths celebrating the feast of the Resurrection. (See Fig. 21.) One blows the flute, the others dance a solemn cancan. The deaths show different stages of dissolution; two are almost completely skeletonized. An interesting tale is told of the artist's difficulty in drawing the skeletons. He wished to borrow a skeleton from Schedel to serve as a model. Schedel, however, possessed only a thigh bone; from this the artist developed the whole of the extremities. This woodcut is an amusing and sophisticated caricature of the Totentanz motive, invented by a physician himself, perhaps as a comeback to the special satire against the physician of the Dance of Death. It is, therefore, of especial interest to us. In these scattered Totentanz illustrations no cut representing the physician has been found.

Towards the end of the fifteenth century, and particularly in the first decade of the sixteenth, the development of the graphic arts led to a gradual transition from the older dance of death woodcut, which was more or less dependent upon the accompanying text, and dealing with type forms and with flat surfaces, to a more pictorial and poetic presentation of death phantasies. The technic slowly developed into one dealing with a variety of strokes, shadows and living lines; the figures came to be placed in a well-defined landscape or architectonic surrounding, and were developed into living individuals unique in their appearance and significance. Death, from a mummy, became a skeleton. The artist was bound by no text; he was free to follow only his imagination. Such was the graphic art displayed by Dürer in his "Spaziergang" (1479), "Der Tod und der Landsknecht" (1510); "Ritter, Tod und Teufel" (1513), by Burgkmair in "Der Tod als Würger" (1510); in the "Tod und Frau" of Baldung Grien (1515); in the "Der lauernde Tod" of Urs Graf (1524); and in numerous other creations of the masters of the early sixteenth century.

Septima etas mūdi CCLXIIII
Imago mortis



Morte nihil melius. vita nil peius iniqua
O p̄ma mors hoim. reqes eterna laborū
Tu ſenile iugum domino volente relaxas
Vinctorūqʒ graues adimis ceruice cathenas
Exiliumqʒ leuas. ⁊ carceris hoſtia frangis
Eripis indignis. iuſti bona ptibus equans
Atqʒ immota manes. nulla exorabilis arte
A primo prefixa die. tu cuncta quieto
Ferre iubes animo. promiſſo fine laborum
Te ſine ſupplicium. vita eſt carcer perennis

FIG. 21. WOODCUT OF DANCE OF DEATH. FROM DR. SCHEDEL'S "WELTCHRONIK," NÜRNBERG, 1493. (AFTER THE ORIGINAL IN THE CLEMENTS LIBRARY, ANN ARBOR.)

The block books, incunabula and the single woodcut illustrations of the graphic artists of this period marked the transition period from the Totentanz of the old wall-paintings to the supreme creation of Holbein, and prepared the way for his great masterpiece. In this period the way was paved for the development of the modern conception of death. The stereotyped forms of the old dance became real and living personages. While the art of the fifteenth century sought to obtain the effect of dramatic action through violent movement, eccentric positions and grotesque gestures, the art of the sixteenth century sought to tell a dramatically living story, that of the conflict between life and death. The dramatic motive changes from a single conflict between these two forces to a spiritual analysis of their combined actions and reactions. The characterization becomes more psychological and of deeper significance, more closely allied to the modern conception of the philosophy of life. Through the German book-illustration of the last decade of the fifteenth an the early sixteenth century may be traced a continuous art-evolution from the old dance of death wall-paintings to the modern representations of the motive. France took no part in this art-development, the Danse Macabre stagnated in countless editions and repetitions of the medieval form.

Through this transition period the Physician of the Dance of Death has wandered unchanged. He is still the urine-gazer, presented regularly in a half hypocritical, half-satirical manner. For the painters of the dances of death he was a favorite subject; he must have appealed in a similar way to the onlookers. Many of the latter must have personally appreciated the satirical justice of the physician, who may have been responsible for the death of friend or relative, himself becoming one of death's victims. Surely the never-failing satire of the urine bottle, which in all of the Totentänze is represented in the same manner, must have done much to bring discredit upon this professional pose. It is all too evident from the constant use of this motive in the Totentänze that the popular mind had little belief in, or respect for, this symbol of quackery and charlatanry. Aside from his representation in the special dance of death art of the period, the contemporary literature and book illustration, as well as the graphic art of the times, contains many allusions to, and representations of the physician himself. None of these presents a flattering picture; quite the opposite. With coarse humor, bitter satire and irony, he is accorded the same ridicule and distrust shown the clergy. His origin in and relationship to the priesthood made him also a common object of the caricature accorded the latter. Towards the close of the fifteenth century the medieval world was approaching the beginning of a new cycle. Characteristic of the epoch was the appearance in numbers of bold and free spirits as path breakers in the field of knowledge. In their fight against ignorance and blind stupidity, satire became a most potent weapon. In the satirical literature of the revolutionary thought of the period, contemporary life was pictured with great originality and vivacity; and the position of the physician in the civic society of the times was accorded a similar illuminating treatment. If we reconstruct the life of the contemporary physician from the prose and poetic literature of the pre-reformation time, we find him painted in black colors indeed. He became a shining target for the scoff and scorn of the Renaissance period. There were many reasons for this antagonistic attitude against the physician. The association of the man of medicine with the clergy, from which he had evolved only in the previous century, naturally let him in for a share of the hatred and distrust aimed at the latter. Further, his therapeutic impotence, with his dishonest assumptions and pretences, stamped him as a rogue skilled only in the trickery and knavery of the quack. Cupidity was one of the least, though most common, evils ascribed to him; and all of these qualities served to discredit him both with the common people and the more educated classes. Added to these characteristics was the influence of the shameful and cowardly rôle the physician played in the inquisition of witches. There were striking exceptions to the general attitude of the physician in this matter; some bolder than their fellows were burned alive, or forced into exile, for their denunciation of this persecution of alleged witches. The popular opinion of the physician and his trade is reflected in the moral-satirical "Narrenschiff" of Sebastian Brant (Basel, 1494), and in Thomas Murner's "Narrenbeschwörung" (Strassburg, 1512). In the Latin edition of Brant's book there is a woodcut representing the physician with the fool's cap and bells upon his head. Murner has this to say over the diagnostic ability of the physician:

Galien und Meister Hippokras
Die haben mich gelehret das
Wo Wasser sei, da ist es nass,
Stirbt er nicht, so wird ihm bass (good).

The physician can diagnose jaundice, gout, vertigo, bladder trouble, stone, and many other conditions by the examination of the urine, and can cure all of these. Only when it comes to the heart is he willing to confess his impotence.

Sag an wie steht es um das Herz?
Ach Herr ich leide grossen Schmerz
Denn eine Liebste hatte ich,
Die ohne Schuld mich liess im Stich
O welche Lust wenn ich sie schaute
Jetzt hat verbannt mich meine Traute.
Nun hilf dir Gott du bist sehr krank
Es dauert mit dir nicht mehr lang.
Erduldet dein Herz solche Pein
Wie kann es da ein Wunder sein
Dass alle Glieder schwächer sind,
Und ich dich in Spitale find,
Ich weiss es selbst, wie das greift an
Die weil ich selber litt daran
Dafür hilft dir kein Recipe.

(*To be Continued*)

BENJAMIN RUSH AND HIS CRITICS*

By JAMES HENDRIE LLOYD, M.D.

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TO write a eulogy of Benjamin Rush today is something of an adventure. This is not the day apparently for writing eulogies of our great men. On the contrary, a curious custom has arisen amongst us of what is called "debunking" history. I should hesitate to use this vulgarism here were it not becoming so common that there is no other way than to call it by its own name and appraise it at its own worth. We are asked and expected to believe that the highest form of criticism is that which would destroy our best heroisms and traditions. The fame of Benjamin Rush has not escaped this kind of dissection. Only recently an editorial writer has announced that Rush did not write a page that was of scientific value, and an attempt has been made to explode what is called the "Rush-Myth." Iconoclasm can hardly go further in our profession.

Rush seems to have had a genius for making critics, if not enemies. Some of these critics were political and personal; others have been medical; and of the two kinds the latter are today the more vocal.

The former do not much concern us here, but they may be briefly noted. Rush was blamed for criticising Washington; for stating that General Mercer died from natural causes and not of his wound received at the battle of Princeton; and for saying some severe things about Dr. William Shippen who was Director General of the Military Hospitals of the Continental Army. He was also engaged in the controversy over Gen. Joseph Reed, who was accused of something worse than lukewarmness towards the cause of the Revolution. This controversy has raged until our own time.[1]

But Rush was not the only man who criticised Washington. The times were parlous. Men were restless, apprehensive and impatient. They wanted results and without delay. The criticism directed against the great commander at Valley Forge may remind us of that with which Grant was assailed during his campaign in Virginia. The mild note of discontent that was uttered by Rush in his letter to Patrick Henry was caused by no lack of patriotism. The worst that can be said about the letter is that it was anonymous; but there seems to have been no doubt that it was written by Rush.[2] He is said to have had a "sense of superiority," and he was indeed a superior man. This may have made him sometimes hypercritical, and aroused a feeling of resentment, which in turn raised a host of enemies against him.[3]

Benjamin Rush was born in 1745, and seems to have matured early. He was not yet fifteen years old when he graduated at Princeton, and he was only thirty when he signed the Declaration of Independence. He did this when some other men backed out. He studied abroad, and was one of a small group of Philadelphia men who graduated in medicine at Edinburgh, where he attracted the favorable notice of Cullen. Before his time medical degrees were scarce in America, as there were no medical colleges here to grant them. Most of the Colonial practitioners had studied medicine merely as apprentices in the offices of their preceptors, and were non-graduates. It is no wonder that Dr. Rush felt a slight sense of superiority.

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* Read before the Section on Medical History of The College of Physicians of Philadelphia, January 13, 1930.

He was also a man of literary culture, as his writings evince. Some of them abound in literary and poetical quotations, for which also he has been criticised. We doctors today do not care much for poetical quotations; we prefer statistics. But Rush had a good literary style, which makes his writings easy to read and interesting.

The name of Rush is identified with the great epidemic of yellow fever, which swept over Philadelphia in 1793; and much of the criticism from which he has suffered arose out of that calamity. I shall not attempt to discuss it. It has been fully and only recently discussed by Dr. Joseph McFarland of this city.[4] It may be called a period of bloodshed; and Rush was indeed an unmerciful bleeder. This was the crux of the whole criticism. McFarland tells us much about Rush's ideas and practice, and his vilification by an Englishman named Cobbett, who called him a "rush-light," and was mulcted in a libel-suit for $5000, which was given by Rush to the poor. He has also been criticised for opposing nature, by Oliver Wendell Holmes, who charged that Rush spoke "habitually of nature as an intruder in the sick room." But we can only surmise what Holmes meant by Nature. This term, as used by some writers, denotes only an anthropomorphic creation of their own brains. For them Nature is a beneficent deity; but they ignore the fact that she is the nursing mother of microbes and spirochetes; of malarial mosquitoes, tsetse flies and rat-fleas, which spread such havoc throughout the human race. If we are not to oppose her, we might as well give up our therapeutics. Benjamin Rush never opposed Nature unless he thought he detected her in the act of killing one of his patients. But the science of bacteriology was not yet born. His methods were doubtless crude, and they seem to us today like the methods of despair. It was war to the death, and no doubt death often won. But we should also bear in mind that Rush's account of the scourge was the best history of an epidemic that had ever been written up to that time.[5]

His opinion that yellow fever was caused by damaged coffee lying on the wharves, was no more fanciful than the widespread belief that malaria was caused by "miasm" arising from decaying vegetation in the swamps.

There is space here to refer only briefly to the work upon which I am more than willing to base my eulogy of Benjamin Rush. In 1812 he published his "Medical Inquiries and Observations upon the Diseases of the Mind," a book of which Tuke says that had he written nothing else, it would have given him an enduring name in the republic of medical letters.[6] It has been ably commented on by Dr. Charles K. Mills in a paper read before the Medico-Legal Society of New York some years ago.[7] In this work Rush was in every sense a pioneer. The book had no successor in America until the year 1883, for Isaac Ray's work on the Medical Jurisprudence of Insanity, in 1838, treated only one phase of the subject. In other words, a period of seventy-one years was to elapse before American psychiatry was to produce another systematic treatise on insanity. Before the time of Rush the state of this literature in the old country was not much better. Tuke gives the titles of books published in England during the latter half of the 18th and beginning of the 19th centuries, and they seem to have been few and unimportant, for he speaks rather slightingly of them.[8] Certainly they did not serve as models for the work of Rush, which was marked by its originality and insight. One of its striking merits is that it approaches the subject from the standpoint of the pathologist. Insanity is a disease of the brain, to be included among all bodily diseases. There is little or nothing metaphysical about it, and Rush even urged that it should be taught as a part of the regular curriculum of the medical schools, a thing that was not done until long after his day. His pathology is of course primitive or archaic; he knew nothing about microbes and spirochetes, neurones and endocrine glands; yet he insists that the seat of the disease is in the blood-vessels, thus affecting the brain; an idea which is not very unlike our own ideas today in respect of some of the mental disorders.

As a clinician Rush was at his best. He knew how to recognize a mental disease and to describe it briefly and to the point. There is nothing dull or prolix in his book. Of course, from our standpoint, he gets his cases mixed up. It is easy to see under one head cases of simple melancholia, atonic melancholia, circular insanity, hypomania, manic-depressive insanity and dementia precox. Mere names and classification did not bother him over much; the day had not yet come for a free fight over such things. Nevertheless, he makes some good suggestions, as when he proposes the term *tristimania* to replace melancholia. He did not like the term melancholia, because it means literally black bile and has been handed down to us from the ancient humorists. His term *tristimania* might well be substituted today for Kraepelin's awkward manic-depressive insanity. His chapter on the causes of insanity is full and interesting, even if some of the causes are rather far-fetched.

Some of his clinical observations are worth a note. He relates a case which we today would call an instance of identical twins; that is, twins developed from the same ovum. It was the case of twin brothers, who looked so much alike that their nearest friends could hardly tell them apart. They both served in the Revolutionary War as commissioned officers, and after the war they settled down in New England in separate towns, where they lived miles apart until middle life, when they developed the same mental disorder and both committed suicide. This subject of identical twins and their identical diseases has been recently engaging attention in our medical societies. He speaks of three near relatives admitted to the Pennsylvania Hospital for insanity on the same day, probably an instance of what the French call *folie communiqué*. I have myself seen three sisters admitted to that same hospital on the same day, after they had been shutting themselves up in their house, communicating their delusions one to another; an instance of imitative or communicative insanity.

Rush seems to have anticipated the modern psychoanalysts. For example, he has some original ideas about what the Freudians call mental catharsis; that is, inducing a patient to disgorge the ugly secrets of his subconscious by a process of tedious catechising. But Rush would do this by having the patient write down in black and white an account of all this mental lumber, and then read it over to himself. One insane patient who did this was so disgusted with himself, when he read what he had written, that he discarded the whole abomination, and doubtless felt better. This method might be worth a trial today. In this connection Rush speaks of the repressed emotions, such as envy and hatred, and their evil effects on the mind. In another place he refers to the old Greek myth of Ajax, who went insane and was obsessed with an insane impulse to kill Ulysses, who he thought had injured him. But as he could not get at Ulysses he killed a ram as a substitute, an example probably of vicarious sacrifice, an idea handed down from very primitive man, as shown also in the story of Abraham and Isaac. It is true, Rush did not explain it in that way, but thought it was a case of mistaken identity or false perception in an insane man. He might better perhaps have seen in it the beneficial effect of substituting one powerful emotion for another in the insane mind, a subject on which he discourses elsewhere.

He tells us about the mental disorder of the Tories and lukewarm Americans who were not in sympathy with the Revolutionary War. He calls it the Tory Rot, and says it was confined to those friends of Great Britain and to those timid Americans who took no part in the war, and he assures us that many of them died of it. We call such men today pacifists and defeatists. They were much in evidence during the recent World War; men who were too proud to fight and clamored for peace without victory.

Among the political causes of insanity he also speaks of the French Revolution, an instance which has long been recognized.

A good example of Rush's insight is found where he speaks of the insanity of old age or, as we call it, involutional melancholia. He thinks it not so common in old women as in old men, because the former have more resources than the latter. An old woman who can knit and sew and help to look after her house, keeps herself alert and interested; whereas an old man, deprived of his usual occupation, especially if he is without mental resources, is more apt to develop some mental disorder.

Rush probably nowhere shows his psychological insight better than in his references to the association of ideas, a fundamental law of psychology in man and brute, in the sane and insane, which might help us to unlock some hidden places in the mind. Today it is exploited in the so-called "conditioned reflexes" in the lower animals, as though it were something new.

Rush was an early exponent of what came to be called moral insanity. He has a chapter on Derangement in the Moral Faculties, but he confesses his inability to determine how far persons thus affected should be considered responsible to human or divine laws. This has been a subject of controversy in our own day, especially in medico-legal cases, and seems likely to continue to be so, in the "lingo" of our present school of behaviorists. He also writes about derangement of the emotions, and recommends bleeding for the disorders caused by disappointed love.

Some of his ideas are curiously original for his times. Thus he speaks of insanity skipping one or more generations, a truly biological idea. He had observed the beneficial effect of malaria on the insane, and speaks of sending insane patients over into the New Jersey swamps where they might obtain a dose of it. This was many years before we began treating syphilitics with the malarial plasmodium. Perhaps some of his patients were syphilitics. He advocated the very early treatment of the insane in private hospitals, a thoroughly up-to-date idea; and he would have special hospitals for dipsomaniacs. Among his favorite remedies were music, occupation, baths and even something like massage. He lectured to the University students on the Medical Jurisprudence of Insanity. His ideas of treatment were thoroughly humane and well in accord with those of Pinel and Tuke, who did so much to abolish the horrors of the madhouse. If he advocated, as he did, the use of bleeding, leeches, cupping, salivation, calomel and jalap, he also mingled with these a good deal of piety and moralizing in the best modern fashion. He was in favor of the abolition of capital punishment and the reform of criminals, in which respects he was doubtless too far ahead of common sense. But unfortunately he has his imitators today in this so-called philanthropy.

It must be acknowledged that Rush invented a machine which he called a "Gyrator"; also another called a "Tranquillizer"; but whatever effect the latter may have had on his patients, it seems to have had anything but a tranquillizing effect on his critics.

To suppose that Rush's heroic use of the lancet in his treatment of the insane was peculiar to him is to show a complete misapprehension of his times. Tuke, the historian of the insane in the British Islands and in America, quotes Esquirol to the effect that the usage can be dated back to Harvey's discovery of the circulation of the blood. It was believed that we had discovered the cause of every disorder, and that by bleeding the insane to faintness the bleeders cured them. This treatment was extended to all the insane. At Bethlem Hospital in in London in 1811 Crowther bled 150 insane patients "at one time." Esquirol in France had an insane patient who had been bled thirteen times in forty-eight hours. Tuke quotes other authorities for the treatment as late as 1837, although by that time a strong reaction against it had set in.[9]

If men are to be judged severely because they are not ahead of their times, it might go hard with some of us here today. We do not indeed take blood from our patients' veins, but we inject arsenic into them. What our successors one hundred years from now may say about us, is at least an interesting subject for meditation.

But why may not Rush have been right in some of his cases, as for instance in furious mania? How can we judge who never saw his method tried? Mills queries whether we may not have "recoiled too far" from the lancet of Rush.[10]

Weir Mitchell said of Rush's book that it was a masterpiece. Mills says that Rush was one of the Americans who have done most for psychiatry.

Considering the state of this science in his time and in this country, the backward state of general pathology, the semi-barbarous therapeutics that prevailed in all departments of medicine everywhere; and on the other hand his close observation, scientific spirit and literary merits; considering all this, I feel that I am conservative in saying that Rush's work on "Diseases of the Mind" is one of the most noteworthy books on the subject that have ever been written in the English language. Let us hope that the day is far distant when his critics will succeed in exploding the "Rush-Myth."

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WILLIAM HUNTER'S OBSTETRICAL CAREER

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SINCE the publication of my "Memoir of William and John Hunter" in 1924, I have discovered that the details of William's association with the Middlesex and Brownlow Street Lying-in Hospitals are inaccurately recorded. His first introduction to midwifery came to him during the two years, 1737–39, while he was Cullen's assistant in country practice at Hamilton. On his removal to London, in 1740, it was renewed under the personal supervision of William Smellie, with whom he found a temporary home in Pall Mall from November 1740 to August-September 1741. During the intervening winter months his theoretical knowledge had been improved by attendance at the courses of Dr. Frank Nicholls which included lectures on the art of midwifery, and when the summer was over, William Hunter decided that he had gleaned what he could from Smellie's private tuition and that the time had come for him to take another step forward.

There can be no doubt that the instruction he had received from Smellie was the foundation of much of his subsequent success, while the somewhat awkward and uncouth manners of his teacher and fellow Scotsman had taught him a useful lesson in suggesting to him the cultivation of the more courtly bearing which subsequently procured for him his appointment to Queen Charlotte. In the autumn of 1741, armed with an introduction to Dr. James Douglas, he made his way to Red Lion Square, where he was kindly received and invited to become Douglas' anatomical assistant and tutor to his son. Short as his association with Douglas was destined to be, for James Douglas died in April 1742, the effect it produced upon William Hunter's character was threefold: a love of books, a zeal for anatomy and a choice of obstetrics as a means of future livelihood. William Hunter had been fortunate in his teachers, Cullen, Smellie, Nicholls, Douglas: all of them were remarkable men and each attained distinction in medicine, but the influence of James Douglas was probably the most far-reaching. As a bibliophile he had brought together a superb collection of the various editions of Horace, of which he published a catalogue; as an anatomist he had demonstrated Douglas's pouch; as an obstetrician he has been immortalised by Pope:

> There all the learned shall at the labour stand,
> And Douglas lend his soft obstetric hand.

In October 1746 William Hunter announced his first course of lectures on anatomy in the Little Piazza, Covent Garden; in 1747 he became a member of the Corporation of Surgeons; and in 1748, the year that John Hunter joined him in London, he first definitely associated himself with the practice of midwifery. At that time the foremost practitioners of this special branch of medicine in London were Sir Richard Manningham, Dr. Francis Sandys[1] and William Smellie. In 1739 Manningham had opened a small lying-in hospital in Jermyn Street next to his own house (and not as Aveling says in the parochial infirmary of St. James, Westminster), the history of which shows it to have been not only the first lying-in institution in the British Dominions, but the lineal progenitor of the hospital which, after many vicissitudes eventually became known as Queen Charlotte's Maternity Hospital. The early history of Queen Charlotte's was unknown to Ryan, its secretary and historian; its identity with Manningham's hospital is now proved beyond doubt, but pending the publication of its history between 1739 and 1809, the only printed information is to be found in a paper of mine.[2] Dr. Francis Sandys was in fashionable practice and, as will be seen, was on the consulting staff of the Middlesex Hospital, but William Smellie was unattached to any lying-in institution; it was by attending and lecturing in the homes of the poor that he raised himself by his unaided skill to the foremost position in his profession.

In 1745 the Middlesex Hospital had been established, and two years later a proposal was adopted that part of the hospital should be allocated to the reception of married lying-in women. Mr. (afterwards Dr.) Daniel Layard was elected man-midwife in ordinary and Dr. Francis Sandys man-midwife extraordinary, and it was resolved that no woman should be permitted to act as midwife, and that no pupils should attend the lying-in ward for which a nurse was engaged at a salary of £8 per annum.

In November 1748 Dr. Layard acquainted the Board that his health required his absence for some time and desired that Mr. William Hunter, who had already become a subscriber to and governor of the Hospital, should be permitted to officiate for him, and that gentleman being approved by Dr. Sandys, this was unanimously granted.

During 1749 a proposal was made by some of the physicians and governors, among them Dr. Sandys, to convert the whole hospital into a lying-in infirmary or, in the alternative, to make the lying-in department independent of the main institution; but the proposals were rejected by a majority of the governors. Meanwhile William Hunter was acting as deputy for Dr. Layard who had gone abroad, and when in August, 1749, Dr. Sandys resigned, it would seem that William Hunter had the sole charge of the lying-in ward. A letter was then sent to Dr. Layard asking him whether he intended to continue his services to the hospital; but the nature of his reply and the actual date of his resignation are not recorded.[3] All we know is that on October 12, 1749, Dr. William Douglas[4] was elected man-midwife "in the room of Dr. Sandys," and it appears that thereupon William Hunter's connection with the Middlesex Hospital terminated. He was at no time more than Layard's deputy and consequently finds no place in the list of the honorary staff.

The dissentient governors of the Middlesex Hospital had not been idle, and on November 3, 1749 the promoters of the Lying-in Hospital for Women in Brownlow Street, Holborn, met for the first time, among them being Dr. Sandys and William Hunter. On November 17, which is recorded as the date of its foundation, four gentlemen who practised midwifery were chosen to attend the hospital, they being Dr. Francis Sandys, Dr. Daniel Layard, Mr. William Hunter, surgeon,. "Little Piazza, Covent Garden," and Mr. John Torr, surgeon. Twenty beds were provided and it was resolved that four female pupils, married women or widows of good character, should be permitted to attend the labours for six months under the instruction of the staff. Each was to pay a fee of twenty guineas to the medical staff and receive a certificate of qualification at the end of the course. In this capacity William Hunter continued to act until June 1755, when he resigned his office as surgeon man-midwife and the thanks of the Board were given to "Dr. Hunter for the services he had done the hospital and for his continuing in the hospital as one of its physicians." He had obtained the M.D. Glasgow, in 1750, but apparently did not abandon surgery until 1755, when he was for the first time styled Doctor. On July 1, 1756 he was disfranchised from the Corporation of Surgeons, and on September 30 following, he was admitted a licentiate of the Royal College of Physicians. In July, 1759, Dr. Hunter resigned his office of physician and man-midwife to the hospital in Brownlow Street, then known as the British Lying-in Hospital for married women, and at this meeting it was resolved that "out of respect to Dr. Hunter and for the great benefits received by the charity from him, the thanks of the General Court be given to him and he be desired to accept the place of consulting physician to the hospital which Dr. Hunter accordingly accepted." In the after years he was frequently appointed a member of the Quarterly Committee of the Hospital, and in one or other capacity continued to attend the meetings until September 1782, after which his name disappears from the Minutes. No mention is made of his death which occurred six months later.

It was not my purpose to follow here William Hunter's private practice as an obstetrician or to criticize his operative methods. These have been reviewed at length by Dr. Herbert Spencer in his Fitz Patrick Lectures and his "History of British Obstetrics." But I wish to emphasize again a point to which I drew attention in my Vicary Lecture,[5] which exemplifies William Hunter's acuity of thought and vision, and redounds to his credit. In November 1748 he entered upon his duties as Layard's deputy as man-midwife in ordinary at the Middlesex Hospital and doubtless hoped to succeed in time to an appointment on the staff.

A year later, just before William Douglas' election, in circumstances which admit of no adequate explanation, William Hunter, as if in preparation for his own election either there or at the proposed new hospital in Brownlow Street, took a larger house in the N. W. Piazza of Covent Garden which he gave over as a dissecting room and dwelling house for his brother and his pupils. "My brother's house" he called it, reserving the smaller and earlier apartments in the Little Piazza for his own residence.[6] He appears to me to have grasped the significance of the principle that, for the safety of the women he attended, his practice should not be conducted from premises which served at the same time for anatomical purposes. This is corroborated by the fact that during the winter of 1761 and the spring and autumn of 1762 while he was in attendance upon Queen Caroline, even his lectures were abandoned and there can be little doubt that he anticipated by nearly 100 years the observations of Oliver Wendell Holmes and Semmelweis attributing puerperal fever to the carriage of sepsis from attendant to patient.

Palmam qui meruit ferat.

REFERENCES

1. Francis Sandys, M.D. was Professor of Anatomy at Cambridge and had a large anatomical collection which passed into the possession of William Bromfield, who sold it later to William Hunter for £200. Sandys died in 1771 at an advanced age.
2. Proceedings of the Royal Society of Medicine, Vol. 17: 5, 1924.
3. After Layard's return from the Continent he settled at Huntington where he remained until about 1762 when he returned to London. (See Munk's Roll.)
4. This man was physician to Frederick Prince of Wales, the opponent of Smellie and the scurrilous abuser of Richard Mead. I intend to publish shortly a memoir of him and his contemporary namesake of Boston, New England.
5. Delivered at the John Hunter Bicentenary Celebrations in February 1928 at the Royal College of Surgeons.
6. I had formerly imagined that he had used the Great Piazza as a residence and the Little Piazza for anatomical purposes, but the early minutes of the Brownlow Street Hospital show that in November 1749 he was using the Little Piazza as his residence and that at least after that date the larger house was given over for anatomy and dissecting.

THE INFANT WELFARE MOVEMENT IN THE EIGHTEENTH CENTURY*

PART I

By ERNEST CAULFIELD, M.D.

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INTRODUCTION

THE modern infant welfare movement, at present literally being cried from the housetops, is commonly believed to be a product of twentieth century enlightenment. Our progress in this field however is the cumulative result of years of effort, and in our enthusiasm over our present success, we must not forget, nor fail to give credit to the early workers in the field.

The establishment of the first foundling hospital by Datheus, Archbishop of Milan, in 787 A.D. and the rapid increase in number of these institutions on the continent have been narrated by Payne. These institutions, though noble in themselves, soon reached a period of stagnation and earned a reputation far different from that for which they were originally intended. Founded as a means of relieving the wants and sufferings of exposed and helpless infants, they became in time, institutions for relieving parents of the burden of their children. They can be interpreted as a defense reaction of the middle ages to the inability or unwillingness of the people to cope with the care, wants, ills and sufferings of the infant child. Thus these institutions reached a state which was far from beneficial, and which continued without any effort toward improvement, until Malthus could truthfully say that the surest way to increase infant mortality was to build more foundling hospitals. The reason there were no feelings of resentment toward these institutions, can be attributed to the fact that the life of the child itself was not considered worthy of preservation, if any effort was involved. On the continent and especially in France, such were the efforts toward improving infant welfare.

In England, the situation was somewhat different. The foundling hospital idea did not find expression until a much later period. Nevertheless, infant mortality was terribly high.

This is the story of what might be termed "the dawn of infant welfare." The dark ages, as far as infants were concerned, continued until near the end of the seventeenth century when there was some indication of efforts toward their relief. In spite of these efforts, feeble to be sure, the general state of infancy was little elevated and the picture drawn of early eighteenth century conditions is little different from that of the preceding century. My story is laid in England and more particularly London, for it is there that we have a picture of the conditions of the poor and it is there that we find the first real changes. The contributions of John Bunnell Davis (1780–1824) are commonly accepted as the beginnings of the modern infant welfare movement. This however, is an account of the conditions of the century preceding Davis' contribution and, although the fall in mortality is difficult to estimate, there was a noticeable influence on English social life in that there was a very different attitude developed as to the value of a child's life. The eighteenth century was a period in which the public conscience was awakened and this was a necessary step before any definite advance could be made in the control of disease. Indifference and callousness toward children had to be overcome before any steps toward reducing mortality could be introduced. Children were regarded as a necessary evil and except in time of alarming and grave illness were little considered. Evidence of neglect, cruelty and infanticide are so abundant that one is forced to believe that at times children were not even considered necessary.

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* Delivered in part before the Students at Yale Medical School, May 28, 1928 and May 26, 1930.

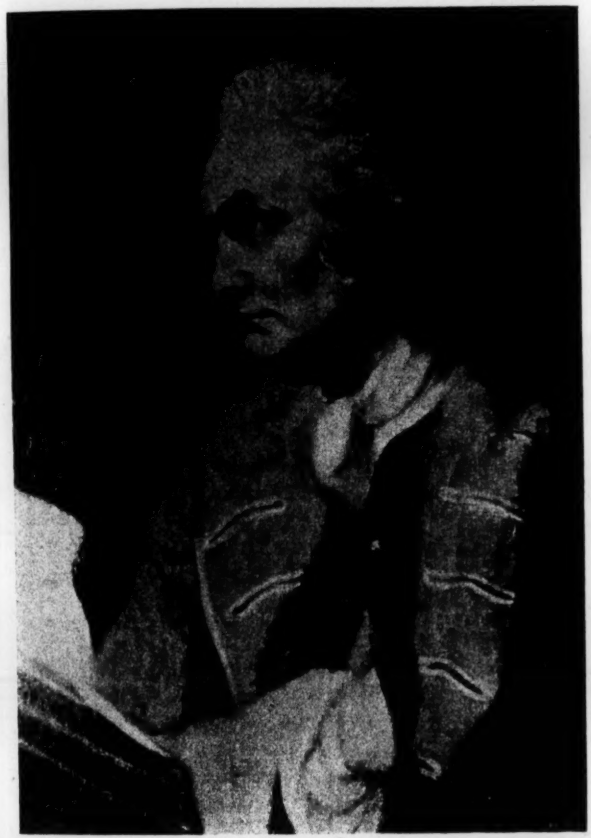


FIG. 1. WILLIAM CADOGAN.

I have arbitrarily selected an age limit of five years so as to avoid becoming involved in such problems as child labor, the apprenticeship system, penal laws, etc. Contributions to the study and cure of infant diseases will also be avoided, except when the subjects overlap. We will, however, be concerned with men who occupy important positions in pediatric history.

THE GENERAL STATE OF INFANCY

"But let any one, who would be fully convinced of this Matter, look over the Bills of Mortality; there he may observe, that almost half the Number of those, who fill up that black List, die under five Years of Age: So that Half the People that come into the World, go out of it again before they become of the least Use to it, or themselves." (Cadogan).

In order to get a fair idea of infant mortality let us examine the Bills of Mortality. The year 1741 may be taken as an example, although the figures for any one decade are quite constant. It must be remembered that the Bills are notoriously inaccurate, i. e. christenings are not births; the buried include only those belonging to the established church; and finally the diagnoses were made by the searchers, a class of unscrupulous and untrained women who obtained their information from gossiping relatives or friends. From the standpoint of infant mortality it should be pointed out that though the primary function of these women was to ascertain that the infant did not die by violence, under the influence of bribery their search was only too superficial.

Roughly speaking, 40 per cent of the deaths in any one year were children under five years of age. In 1741 there were 13,000 deaths in this age period. The christenings for the same year were about 15,000. An exact death rate is not available. The population of London has been estimated at various figures, most of which lie between five and seven hundred thousand. In the two decades (1730–1750) it was stated that 75 per cent of all the children christened were dead before they reached the age of five. The historian Gibbon, in writing his memoirs, stated that 5 brothers and 1 sister had died in early infancy and concluded from his own observations that "The death of a new born child before that of its parents may seem an unnatural, but it is strictly a probable event."

The historical example of the deaths in early infancy of Queen Anne's 18 children was not a misfortune peculiar to the royal family but a commonplace incident of the times. It was accepted as "the profuse waste or imperfect workmanship of nature" without much more ado.

It would be bold, in the face of the gross inaccuracies of the Bills, to attempt any comparisons. But the fact that no great progress has been made in the fifty years previous to this time is evident from that remarkable work of Capt. John Graunt in which he stated:

"That in twenty years there dying of all Diseases and Casualties, 229250, that 71124 died of the Thrush, Convulsions, Rickets, Teeth, and Worms; and as Abortives, Chrysomes, Infants, Livergrown, and Overlaid; that is to say, that about ⅓ of the whole died of those diseases, which we ghess did all light upon children under four or five Years old."[1]

A more detailed examination of the Bills of Mortality throws considerable light upon the state of infancy in general.

For the year 1741 there were 548 cases recorded as "Abortive and Stillborn." Besides the accepted interpretation this included deaths due to difficult labor. The obstetrical forceps had not been in use long enough for the ordinary man-midwife to acquire any degree of proficiency and the fetus was frequently mutilated and delivered piecemeal. This also covered many cases of infanticide that were reported as abortive in order to escape detection.

"Convulsions" were responsible for 8250 deaths of all ages but it can be assumed that the largest number were infants. Here was included the terminal convulsions of any disease, especially when the exact diagnosis was in doubt. "The common name of convulsions passed current for children, who, to judge from what we now see, dyed for want of proper air and proper nourishment." Unrecognized tetany also swelled the list. As late as 1782, especially in Dublin, convulsions, or nine-day fits, caused the deaths of 17 per cent of all infants delivered at the Lying-in Hospital. In London, this disease (tetanus) was responsible for the deaths of 4 per cent of the new-born. There was a marked fall in the mortality from this disease due to the investigations of Dr. Joseph Clarke. Although Clarke attributed the cause to the want of adequate ventilation, the remedies he advocated removed to some extent, the real cause, filth.

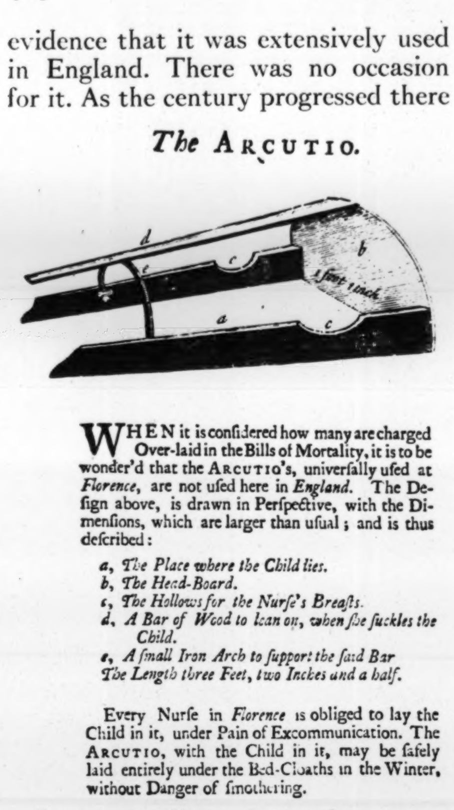
The term "Headmouldshot" meant overriding of the sutures of the cranial vault and included those birth injuries to the underlying meninges which resulted in death. The opposite term "Horshoehead" or separation of the sutures, included congenital defects of the cranium, prematurity and deaths from any cause if accompanied by wide sutures.

"Scald head" was not a frequent cause of death but was an exceedingly frequent disease of infancy. It was used to describe any condition of the scalp: the so-called "cradle cap," eczema, impetigo, and particularly filth. To wash a child's head in the eighteenth century was the surest way to give it a "cold." Belief in teething as a cause of death was, as it is now, a confession of ignorance. In the Bills in question 1500 deaths were attributed to this cause. During the years 1701–1776 there were 90,000 deaths due to teething. No other item better illustrates the inaccuracy of diagnosis.

Among the casualties one stands out strikingly. Seventy infants were "Overlaid." Deaths from this cause were as high as 133 in a single year, and from 1701 to 1776 nearly 4000 infants perished in this manner. Overlaying had been an accepted cause of death from earliest times. "It pleas'd God to take away my sonn Richard, being now a moneth old, yet without any sickness of danger perceivably, being to all appearance a most likely child; we suspected much the nurse had overlayne him; to our extreme sorrow, being now againe reduced to one; but God's will be done" (Evelyn's Diary, March March 26, 1664). It was due to the custom of nurses and infants sleeping in the same bed—a custom resulting from the laziness of the nurses coupled with the belief that the warmth derived from the nurse's body was conducive to the health of the child. It is conceivable, of course, that a few such accidents should occur, and more especially when the profound sleep was occasioned by the drunken habits of the nurse. In the "Art of Nursing" (1733) there appears a description of an ingenious contrivance called an "Arcutio."* This was warmly advocated but there is no

* Although this book has been attributed to Sir John Colbatch (d. 1729) an identical illustration of the arcutio was previously published in the Philosophical Transactions (N°422 p. 256) by Oliver St. John. Was St. John the anonymous author of the "Art of Nursing"?

evidence that it was extensively used in England. There was no occasion for it. As the century progressed there were many expressions of doubt concerning this casualty. "Many, who are said to have been overlaid, or to have expired in fits, I have reason to suspect, have been actually strangled by the tightness of the stay." (The stay was the tie string to the cap that the infant constantly wore even indoors and at night.) It was more than a coincidence that as this subject came to be suspected as a cause of death it gradually disappeared from the Bills and in the course of the next century was recognized in its true guise, infanticide. "He is very kind: and Billy not being well when he came in, my grief passed off without blame. He had said many tender things to me; but added, that if I gave myself so much uneasiness every time the child ailed any thing, he would hire the nurse to overlay him . . ." (Richardson, "Pamela," LXXI, 1740).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The ARCUTIO.

WHEN it is conſidered how many are charged Over-laid in the Bills of Mortality, it is to be wonder'd that the ARCUTIO's, univerſally uſed at *Florence*, are not uſed here in *England*. The Deſign above, is drawn in Perſpective, with the Dimenſions, which are larger than uſual; and is thus deſcribed:

a, *The Place where the Child lies.*
b, *The Head-Board.*
c, *The Hollows for the Nurſe's Breaſts.*
d, *A Bar of Wood to lean on, when ſhe ſuckles the Child.*
e, *A ſmall Iron Arch to ſupport the ſaid Bar*
The Length three Feet, two Inches and a half.

Every Nurſe in *Florence* is obliged to lay the Child in it, under Pain of Excommunication. The ARCUTIO, with the Child in it, may be ſafely laid entirely under the Bed-Cloaths in the Winter, without Danger of ſmothering.

FIG. 2. ARCUTIO USED TO PREVENT OVERLAYING.

Dysentery, diarrhea and other gastrointestinal upsets which necessarily must have contributed tremendously to the infant mortality of the times are variously distributed in the Bills under Flux, Colick, Gripes, Twisting of the Gut, Stoppage in the Stomach, Vomiting, Looseness and Worms.

The infant death rate in the eighteenth century varied with the nature of the disease that was most prevalent. First in importance was the smallpox. Contemporary estimates stated that over 500 children were fatally stricken each year, in spite of the observation that children withstood an attack better than adults. It was commonplace knowledge that a mother could not count her children until after they had the smallpox. Variolation was the subject of many controversies and was practiced with increasing frequency as the century progressed. Jenner, as is well known, did not announce his discovery until 1798. Influenza, which attacked all ages, was particularly prevalent in 1743 and 1782. Fothergill described the putrid sore throat as it appeared in the forties. "Rheumatisms" especially among children were common in 1753 and in this year also, took place a mild epidemic of catarrhal jaundice "in children under 7, chiefly girls." Measles was epidemic in 1763 and 1768. Whooping-cough was frequent and fatal in the years 1773-4. All writers of the century seem to devote considerable time and attention to this last disease. It makes one believe that either the disease was more obnoxious and serious than it is at present or that it was one of the few diseases about which there was no uncertainty in diagnosis.

The second quarter of the century was notable for the increase in the consumption of strong liquors, particularly gin. This was reflected in the decrease in christenings. "The children likewise that are born, come into the world with such bad stamina, that being sickly and feeble, they die in prodigious numbers under five years old." One must read contemporary literature concerning this aspect of English social life with the same degree of caution that one reads the present-day statements of rabid prohibitionists. At that time, the feeble attempts at prohibition with their speakeasies, bootleggers and hooch, run strikingly parallel to our modern efforts at social reform. But we have unimpeachable evidence that mothers and nurses frequently gave liquor to infants to "harden their stomachs" and accustom them to its taste. Gin was called "the real grand destroyer of infants."

> There are some wicked Nurses, reckoned more skillful than the rest, who commonly attend lying-in Women during the Month, and are not afraid to give Wine and Brandy, sweetened perhaps with Sugar, to new-born Infants, with great Secrecy, as often as they can conveniently, to still their crying, and procure Ease to themselves; whence dreadful Symptoms arise from hidden Causes. The same Crime is frequently committed by Nurses that suckle at their own Homes, who not only themselves guzzle down a great Quantity of strong beer and burning Spirits, and thereby heat and spoil their own milk, but also boldly give the same to the tender Infants committed to their Care, and especially in those Gripes which they have occasioned by their own improper Diet or Intemperance.[2]

Hogarth depicted vividly scenes of this gin-drinking period and in the description of the "March to Finchley" Justice Welch points out "but, (what is shocking to behold) a child, with an emaciated countenance, extends its little arms with great earnestness, and wishes for that liquor of which it seems well acquainted with the taste."

A detailed description of the milk supply would not be within the scope of this article. The mind can hardly conceive of the filthy conditions in the city under which cows were kept. And to counterbalance any efforts toward cleanliness, custom allowed the retailers to skim and water the milk to a degree that would make it quite profitable. When it could be written in 1758 that "Cow's milk, will in the summer turn sower and coagulate in 12 hours without any addition" it is no wonder that "spoon" or artificial feeding was attended by a prohibitive mortality.

The matter of the water supply, likewise, is too comprehensive for description here. Consider conditions under which the author of an article on pediatrics would recommend "river water" as a drink for infants.

The most profound and far reaching cause for the terrific waste of infant life can be summarily described in the word Neglect. Neglected by the profession, neglected by their own mothers, and neglected by the nurses to whom they were abandoned, the poor infants must indeed have been endowed with a strong constitution to survive their struggle for existence.

The neglect by the medical profession was of such a degree that it formed a favorite theme of introduction to nearly all the works on pediatrics of the times. The authoritative and widely read Walter Harris stated:

> I know very well in how unbeaten and almost unknown a Path I am treading; for sick Children, and especially Infants, give no other Light into the Knowledge of their Disease, than what we are able to discover from their uneasy Cries, and the uncertain Tokens of their Crossness; for which Reason, several Physicians of the first Rank have openly declared to me, that they go very unwillingly to take care of the Diseases of Children, especially of such as are newly born, as if they were to unravel some strange Mystery, or cure some incurable Distemper.

In 1742 an anonymous physician wrote: " . . . most Physicians, either through Indolence, or the fear of doing Mischief, when the Indications of Cure were not quite so clear as they wished, have commonly resigned those little Patients to the Nurses and old Women, not scrupling to own their superior skill in that Branch of Physick."[3]

George Armstrong, one of the first pediatricians to be content to work among the infant poor of London tells us:

> I Know there are some of the physical tribe who are not fond of practising among infants; and I have heard an eminent physician say, that he never wished to be called in to a young child; because he was really at a loss to Know what to order for it. Nay, I am told, there are physicians of note here, who make no scruple to assert, that there is nothing to be done for children when they are ill. [This remark was credited to William Hunter.][4]

Admitting that the average physician was ignorant of the diseases of infancy; admitting also that the poor themselves were incapable of carrying out directions, even when well-advised; and that the ordinary fee was prohibitive; men inspired with the true spirit of medicine—and there were surely many—would not have neglected their indigent patients without good reason. The well-dressed physician of London, with powdered peruke, jeweled cane and other evidences of wealth was probably "easy picking" if he should dare to venture among the poor in the highways and byways of the great city at a time when holdups, robberies, and even murders were frequent in the light of day.

Perhaps a more accountable reason was that obstetrics as a science was in its infancy. The delivery of women was in the hands of the midwife. Men-midwives, so called, were seldom employed except in cases of difficult labor and as mutilation of the child or cesarian section, which at that time was synonymous with maternal death, were the usual procedures, the woman in labor viewed the approach of a physician with horror. It seems strange to us that in an age ordinarily associated with coarse and licentious manners, a false modesty was a large influencing factor in the employment of aid for pregnant women.

As the care of the new-born child was the province of the accoucheuse, physicians seldom had the opportunity for observation until the child was ready to expire. Consequently, ignorance on the part of physicians in the care of infants was not from choice. The same reason was accountable for their unfamiliarity with the habits and sicknesses of older children.

It has been stated that mothers themselves neglected their offspring.

The fashionable and socially prominent woman was suddenly striken with "the vapours" when confronted with the task of rearing her new-born child. It was simply not the thing to do. It seems incomprehensible that at a time when artificial feeding meant possible if not probable death to the child, maternal nursing should have been held so lightly.

Walter Harris wrote:

> But let us take a Survey of the Advantages that prompt Mothers so commonly to sacrifice their beloved offspring. They are the more free Enjoyment of Diversions; the greater Niceness of adorning their Persons; the Opportunity of receiving impertinent Visits, and returning those insipid Favours; the more frequent attendance on the Theatre, or the spending the greatest Part of the Night at their beloved Cards.[5]

Cadogan professes ignorance: "I am quite at a loss to account for the general practice of sending infants out of doors, to be suckled or dry-nursed by another woman."[6]

But Harris and Cadogan lived and practiced among "the Quality" and had reason to speak with caution of their patients. One Benevolus is not so sparing of their feelings. Writing in the *Gentleman's Magazine* (1752) he strikes out fearlessly: "A mother refuses a child her breast only perhaps to preserve a shape, and to avoid a little trouble." But the ladies were not wholly to blame:

> Parents especially the Fathers, who do not love the Noise or any other of the Inconveniences attending the Care of Children, have a short Way of doing Business by sending them at once into the Country; and to support the Reasonableness of their Conduct, readily tell their Friends, that those who write about these Matters recommend Air, and say that Children thrive best in it. But surely they have never study'd the Duty of Parents, or they must Know, that it is always incumbent on them, unless Necessity prevent it, to rear their Children themselves. But to prove farther that it is not always a child's Good which they seek, so much as their own Ease, it is often sent to be nursed even in *London;* sometimes too in a part much worse than they themselves live in; perhaps where noxious Effluvia are continually surrounding it; or in some narrow Lane or close Alley[7].

The English gentleman was desirous of his own ease and comfort and vain of his wife's appearance. He had more interest in the diseases of his horses than of his children. England could boast of more works on Farriery than on Pediatrics.

Regardless of the cause, these Ladies of Quality, of Rank, of Fortune, of Distinction, of Condition, of Taste, and of what not, simply would not nurse their babies. "The missing of an Opera the first Night, would be more afflicting to her than the Death of a Child," wrote Addison in describing one of these women of quality. Nor was royalty itself above the fashion:

> This [excoriation of the nipples] perhaps may be one great Reason why the Ladies of Quality do not nurse their Children, but pack them off into a Nursery three or four Stories high, so that they may not be disturbed (when at *Quadrille*) by such little squawling Brats as they call 'em: Really I think that those Women who refuse to nurse their own Children do not deserve to bear any, and it can be nothing but *God Almighty's* Super abundant Goodness to them if he send them *Heirs*.
>
> The present Queen Caroline, may be to every Lady a glorious and shining Example of Nursing, or rather Suckling

her Royal Progeny. For her Majesty's good Sense would not suffer others to contribute anything for the Nourishment of her Children, when she was herself so duly qualified for it; until such Time as our *English* Laws debarr'd Her Majesty from so doing, which (as I have been told from good Hands) was no small Concern to this crown'd Head; whom God long preserve.[8]

Just what were the purposes of these laws is not clear but it is significant that we find among the official promotions in 1737:

"Mrs. Tebb, Wet-nurse to the newborn Princess, with a Salary of 100 Guineas a year; and Miss Melvil, Rocker. Mrs. Collins, Dry-nurse to the Princess of Wales." And again on the birth of the Prince of Wales in 1762: Wet nurse, Mrs. Scott, Dry nurse, Mrs. Chapman, Rockers, Jane Simpson and Catherine Johnson.

As regards maternal nursing, the infants of the poor were slightly better off. "Spoon feeding" had not come into general use, wet-nurses commanded fees that the indigent mother could not afford. And so these mothers had to nurse their own children, especially in times when labor was cheap and unemployment prevalent. In time of sickness, the infant of the lower classes received little or no attention, until the days of George Armstrong. (We must not be too hasty in drawing such conclusions. It is quite possible that there were some public-spirited physicians, or more likely apothecaries, who practiced among the infant poor and whose glory yet remains unsung.) The great majority, we can be sure, when taken sick, were allowed to die, or died in spite of the attendance of the wise old women, quacks and charlatans.

The children of the wealthy were neglected because of fashion, the children of the poor were neglected because of poverty. It must be remembered that a large part of the inhabitants of London were poor, miserably poor. The prevalence of robbery, thievery, and even murder had an economic basis, not a moral one. The pitiful wails of a sick child were not of much concern to a people who themselves were struggling for a bare existence. Even smallpox was regarded as a gift from heaven to relieve the poor man of the burden of his family.

> But there is still another reason why children are sometimes neglected, which I am sorry to mention, but of its truth I am convinced from experience. It is this: children while in their infancy, especially if the young family is numerous, and the parents in straightened circumstances, are not thought of sufficient consequence to be much attended to, unless some sudden or violent illness happens to give an alarm. This Secret has sometimes come out in my hearing, even by persons who were not reckoned poor; . . .[9]

If, however, the mother in these lower strata, either in imitation of her more fortunate sisters or from sheer poverty, wished to give up nursing her child or to be relieved of its care, there were other avenues open to her. These same means were frequently employed by the unmarried mother who wished to avoid that stigma which prevented her from obtaining employment or reëstablishing herself in society. For even in this age of licentiousness, the unmarried mother was the lowest of the social outcasts. The methods at her command were (1) dropping the child or (2) abandoning it to the parish workhouse. This second custom will be discussed in a later section.

"Dropping" of infants was an extremely frequent occurrence during this period and was accepted by all classes without comment. That prototype of English gentlemen, Mr. Alworthy, was not too greatly concerned with the circumstances surrounding the advent of Tom Jones.

"At Hicks-hall a Woman was convicted of dropping a child in St. George's Parish, Hanover Square, and sentenced to a Month's hard Labour in Bridewell. Since Christmas last [written in July 1743] 12 children have been dropt in that Parish, and there are but 20 Orphans in the foundling Hospital."[10]

These children were exposed at the doors of the wealthy, the mother hoping, that the inhabitants of the house, moved by compassion, would take it in. The inhabitants, however, with their good nature so frequently abused, hurried the infant off to the parish workhouse. Modern patronesses of charitable endeavors seldom advertise their good deeds as did the Duchess of Buckingham in 1734. The last sentence contains more than a ring of humour:

> Last Tuesday evening, a female child, of about three weeks old was left in a basket at the door of Buckingham House. The Servants, would have carried it into the Park, but the case being some-time after made known to the Duchess, who was told it was too late to send to the overseers of the Parish, and that the child must perish with cold without speedy relief, her grace was touched with compassion, and ordered it to be taken care of. The person who left the letter in the basket is desired, by a penny post-letter, to inform whether the child has been baptized; because, if not, her grace will take care to have it done; and likewise to procure a nurse for it. Her grace doth not propose that this instance of her tenderness should encourage any further presents of this nature, because such attempts will prove fruitless.[11]

The tenderness of her grace was not a universal trait of the common people:

> A Shoemaker's lad having found a basket in the streets with something packed up in it, carried it home to his master, who on opening it, being enraged to find in it a new-born child, threw it out of a two-pair of stairs window, by which it was killed.

We must surmise that a fair number of these "dropt" children must have been well cared for. Otherwise it is difficult to understand how the custom could have been so common and continued for so long a period. It is not surprising to find that the royal palace itself was not immune. Notices similar to the following have been recorded:

> A female infant dropt in St. James palace, was ordered, by his Majesty, to have a nurse provided for it, and to be baptized by the names of Georgina Charlotta Sophia, three ladies of the court, and a lord of the bed-chamber standing sponsors. About 15 years ago a boy and a girl were dropt in the palace, the princesses Amelia and Caroline took the girl and the Duke of Cumberland the boy.

But far worse than any of the incidents mentioned, not infrequently a child was "dropt" or exposed in the streets, in secluded spots, on dunghills and such, where it was left to freeze and starve. It was this class of infants that attracted the attention of Thomas Coram and to which we have devoted another section. In one of the accompanying prints, Hogarth shows such infants being abandoned.

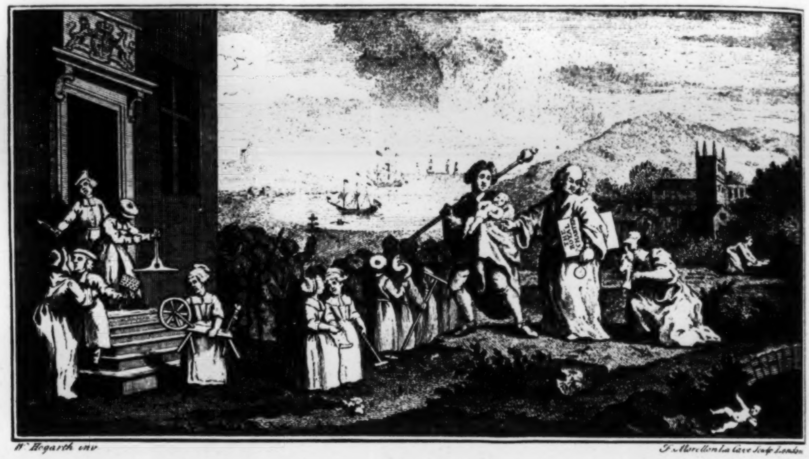
W. Hogarth inv
F. Morellon la Cave Sculp London

Fig. 3. Hogarth's Conception of the Foundlings. On the Extreme Right Are Seen Two "Dropped" Infants.

Many women, especially unmarried ones, did not take the trouble to drop their new born babes, but secretly murdered them. "There is scarce an Assizes" wrote Addision in 1713, "where some unhappy Wretch is not Executed for the Murder of a Child. And how many more of these Monsters of Inhumanity may we suppose to be wholly undiscovered, or cleared for want of Legal Evidence?" In the historical chronicles of the *Gentleman's Magazine* such notices as the following recur with mathematical frequency. "At the Sessions ended at the Old Baily received Sentence of Death, Mercy Hornbey, for the Murder of her bastard Child" (1734). The same fate was suffered by Elizabeth Ambrooke (1735); Jane Cooper (1736); Mary Shrewsbury (1737) to mention only a very few. It was the story of the life and vicissitudes of one of these women that formed the theme of George Eliot's "Adam Bede." The action was placed about 1800 however. This problem of the murder of the new-born occupied an important place in forensic medicine, well into the nineteenth century, and it is gratifying to us that such books as "Signs of Murder in New-Born Children" are merely of historical interest.

In an effort to attack the problem of infanticide, an act was passed in the time of King James I which declared that mere concealment of birth could be used as conclusive evidence of guilt against the mother, if the child was subsequently found dead. This act was later repealed.

All the writers who devote time to the subject of mothers nursing their children, leave us with the impression that nurses were creatures devoid of any elements of compassion or gentleness. There were of course many of them devoted to their wards, whose mistakes can be forgiven them because of the ignorance of the age. But the larger number were "destitute of all reason, knowledge and principle in short of almost everything but mercenary prospects." This profound ignorance and its concomitant, an exaggerated assumption of learning in all things infantile, contributed in no small degree to the tremendous mortality. This pretense to knowledge was executed with such skill that it deceived even the elect.

"They are so jealous and tenacious of what they suppose their authority upon these occasions, as seldom to suffer themselves to be directed or advised; any advice therefore given them, they consider as a reflection upon their judgment, and, in vindication of which, they as commonly reject it."

There is some evidence that the shortcomings of these nurses were somewhat exaggerated. All of the ills from which Samuel Johnson suffered were attributed to his wet-nurse.

The average physician with a realization of his own shortcomings not unwillingly stood aside. Mercenary wet-nursing was the keystone to most infant troubles. If the care of the child interfered in any way with the nurse's pursuit of happiness, the sleeping potion, Godfrey's Cordial, Dalby's Carminative, or the dram of gin came into use. Her knowledge of pediatrics was determined solely by the deftness with which she could swathe the infant. At the period in which custom allowed, or perhaps demanded, that the nurse should care for the child at her own home, it was the adopted child who was the victim, for she considered it her chief duty to conceal any disease that could possibly be attributed to her own negligence.

> In what Dangers therefore are all those that suck! From this and other Causes, which I shall soon mention, it is, that the Passing-Bells are often heard to toll, for some innocent Infant that suffers for the Faults of his Nurse, and perishes from no other Cause, than he has had the Misfortune to suck a Nurse, who is intemperate, nasty, ill-natured, or endued with some ill Quality or other.
>
> To the same Cause was owing an Observation which was made not long ago by a worthy Divine, Rector of a Parish 12 miles from London, who with great Grief of Mind told me seriously, that his Parish, which was not small either in its Bounds or Number of Inhabitants, and was situated in a very wholesome Air, was when he first came to it, filled with sucking Infants, and yet in the Space of one Year, that he had buried them all except two, . . . , and that the same number of small Infants being soon twice supplied, according to the usual Custom of hireling Nurses, from the very great and almost inexhaustible City, he had committed them all to their Parent Earth, in the very same year.[12]

Whenever the foster child expired it was assumed that the nurse had neglected it in favor of her own child. Instead of correcting this abuse at its source other expedients were adopted. Fashions are never changed by criticism but often lead to worse ones. It then became the custom to take the wet-nurse into the home of the foster child where her manners and habits could be supervised. It meant, however, that she would have to abandon her own infant to the care of some one less scrupulous than herself. It merely meant that one class of infants should survive at the cost of the lives of others. "I am sure I speak within the truth, that not one in twenty of those children live who are thus abandoned by their mothers." In another place we read "How common it is to hear that the children of wet-nurses have died soon after their mothers have deserted them. It indeed scarcely ever happens, that a month passes over, when a wet-nurse takes a place, without her being summoned to the bedside of her sick infant." More the pity when the general healthfulness of the nurse's child was taken as the sole criterion of the quality of her milk, at the time she applied for a position. The grief that was caused by the loss of her own child was hardly more than temporary. It is difficult to suppose that a women who would abandon her new-born child for the prospects of mercenary reward, with the full knowledge of the consequences, would be moved to any great extent when the expected happened. But even though temporary, this passing grief was enough to upset the foster child at her breast and she was therefore kept in ignorance with respect to her own infant. "This is a Case so probable in its nature that in some particular Instances such mother-nurses are not permitted to know anything that passes in relation to their own Child and Family."

A position in a wealthy family was very tempting to girls and women of the lower classes. Besides the comforts of a good home they were treated with respect. Positions or employment for women that carried a living wage were very few. Such conditions led to many women and girls (some of them quite young) having children illegitimately so that they could qualify as wet-nurses, a custom for which fashion was responsible. The child, born in such circumstances was of secondary or no importance. It could be "dropt" in the streets or conveniently "overlaid."

CRUELTY TO CHILDREN

One of the characteristics of the seventeenth and preceding centuries was cruelty to children. A child brutally disfigured with the loss of an eye or limb was commonly used by vagabonds and beggars to incite pity. Conditions had improved a great deal in the eighteenth century and legally, at least, such habits were not tolerated. But a people who had not yet learned the value of a child could not be expected to be wholly free from vicious habits. We are all familiar with the pictures drawn by Dickens of nineteenth century conditions. These, however, mostly concern older children and were inextricably concerned with the apprenticeship system. The following taken from contemporary periodicals need no comment:

> Among the vagrants found begging in the streets of London and carried before the Lord Mayor to be passed to their respective parishes: was a woman with a child in her arms, which, upon her examination, appeared to be hired at the rate of 8 pence a day of its mother in Petticoat lane. She was committed to Bridewell to hard labour, and the child returned to its parents.
>
> A young woman was taken into custody, and committed to the Gatehouse for stealing a child, with which, for four months past, she has gone a-begging. She was first discovered by the mother in the Park with the poor infant at her breast almost starved, and it is thought cannot live.
>
> The court at Hick's Hall lately committed Anne Martin, alias Chapney, to Newgate, where she is to be imprisoned two years, pursuant to her sentence: she is accused of putting out the eyes of children, with whom she went a-begging about the country; she has been several times whipped at the cart's tail.

As a part of the program to clear the streets of London of beggars, vagabonds and other disorderly persons, the law directed "That such children who shall be apprehended and are afflicted with any Disease, and have no Persons to take care of them, be cured of such Disease, and then transported." This does not seem so bad until we realize that transportation to the colonies, particularly to America, was considered just one step removed from hanging. Capital punishment knew no age: "four chimney-sweepers boys received sentence of death for shop-lifting." The sentence was probably not unwelcome to those exposed to this job of perpetual and horrible misery. The famous Brownrigg case was only an example of the life of torture incident to the apprenticeship system which we cannot here discuss.

"Stripping" children was another pernicious custom of the times. "Ended the Sessions at the Old Baily, when only Eliz. Banks for stripping and robbing Frances Mercer in Marybone Fields, an infant of 4 years old, was condemned."

In one of the contemporary diatribes against the gin drinking of the period, the following mention is made:

> . . . These miserable Creatures are so infatuated that they will sell their own and their Children's Clothes, and the Beds from under them, rather than want this bewitching Poison. A dreadful instance of this Kind, is fresh in everybody's Memory, of a Woman who murdered her own child, threw it into a Ditch, and strip'd it of the Clothes given it that Day by a Charitable Person, to pawn for *nine Pennyworth of Gin.*[13]

Of more than passing interest to those concerned with the medical practice of the times is the following record:

> A cause was try'd at the Marshalsea Court, Southwark, wherein a Quaker was Plaintiff, and a child of 4 years old, and her Guardians, Defendents. The Child had a sore Finger, which the Plaintiff pretending to Cure, it turned to a Mortification, and he cut it off, brought in a Bill of 15l. arrested the child and confined her several Weeks in the Marshalsea Prison. But the Plaintiff not being bred a regular Surgeon, he was non-suited; and the Court order'd the Bayliff into Custody.

It is a source of satisfaction that he was not a "regular Surgeon."[14]

Summary and Conclusions. The general state of infancy in the eighteenth century was very forcefully summed up by Bishop Madox in a sermon published in 1753 from which the following is quoted:

> While the Provision continues thus defective, what Numbers of Children must unavoidably be excluded from this House of Preservation; and of course, too often delivered up to almost sure Destruction, under the Care, more properly under the cruel Negligence, of certain well known Executioners?
>
> How many other Children, whom Humanity, Religion and true Wisdom should destine to a Dwelling of Health and Safety, are not offered here at all; but wholly given up and confined to the same Slaughter-Houses, where their Lives, and therewith their Pain and Misery are brought to a speedy Conclusion!
>
> Examine the Records of too many parishes.—Then pause a little, and seriously reflect how extensive and how terrible this Execution has been! Of all that vast Number of unhappy Infants, whom narrow-spirited Management and dire Frugality have thus, for many Years, disposed of; how very few, in Proportion, survive and attain to Man's Estate!
>
> How very considerable do these Mischiefs appear, when we add to this mournful Account all those Children, whom impious Barbarity of unnatural

> Parents wilfully destroys by immediate Murder; or more gradually, but not less certainly, burns up and consumes by the fiery Heat of spiritous Liquors; an Instrument of sure Destruction, which together with baneful Opiates, frequently also administer'd in other Places, are absolutely forbid and excluded from this healthful Abode, calculated in all Respects for the Preservation of human Lives.
>
> But you must still increase the melancholy Catalogue of perishing Children, by adding all those, whom the Misfortunes, the Poverty, the Incapacity, the Sickness of distressed Parents cannot maintain and preserve.
>
> Take the sum Total of all these dreadful Articles of Destruction! How large and extensive a Scene of Distress, and Woe, and Ruin; of Sickness, Misery, Guilt and Death, does this united View of neglected, abandoned, perishing Infants open to the compassionate Attention of private Charity, and the effectual Regard of public Wisdom.[15]

One sometimes wonders how any infant could have survived the eighteenth century. But the vast number regularly nursed by their own mothers, or entrusted to the hands of intelligent wet-nurses needs no comment. To those mothers and nurses the survival of the English race was due.

It may also be a source of wonder how such a vast number of wet-nurses was available. The answer is clear if one stops to think. It was not infrequent for one woman to nurse two or three infants successively; also it frequently happened that one woman would nurse two babies with the same supply of milk, either with or without the aid of (or at times in spite of) artificial feeding. But the vast majority of nurses were available, due to the death of their own babies. If over 10,000 children under two years of age died in the year 1741 and a correspondingly large number in other years, the greater part of them must have been nursing babies. The mothers were then available as wet-nurses. Thus we have a vicious cycle. In some cases infant mortality was the source of the wet-nurse supply, in other cases the effect. The death of an infant meant the possible addition of one more wet-nurse, who in turn, if unscrupulous, might cause the death of one more child.

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(*To be Continued*)

THE HISTORY OF CRANIOTOMY:

AN ACCOUNT OF THE METHODS WHICH HAVE BEEN PRACTICED AND THE INSTRUMENTS USED FOR OPENING THE HUMAN SKULL DURING LIFE

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CARDIFF, WALES

'Tis Man's worst deed
To let the things that have been, run to waste
And in the unmeaning Present sink the Past.—Lowell

Ideas are born; they develop; they are transformed; they never die. The history of ideas is the history of the race. They are the real events. Let them be never so new or strange, they have their roots in the far past with a continuity of growth.
Sir Andrew Macphail

Introduction

FAMILIAR though most of us are with the modern methods of performing craniotomy, not all of us are equally well acquainted with the way in which the operations practiced today have evolved from the more primitive efforts of our surgical forefathers. Nor do all of us realise how ancient an operation craniotomy really is, how many and varied have been the methods practiced for its performance and how curious and highly ingenious have been certain of the implements used by its practitioners.

Prof. Archibald Young[130] in his presidential address for the year 1924 to the Royal Medico-Chirurgical Society of Glasgow, used these words:

> Many addresses and lectures have been written in recent years, and many papers contributed to medical journals, whose chief purpose has been to dilate upon the great advances of modern surgery. The lay Press has contributed its quota to the same process of what one may almost call self deception. We are too apt, in consequence, to get into the habit of thinking that most of the achievements of present day surgery are peculiar to this century, or perhaps even to this last decade; that there was no such thing as surgery, in the real sense, until almost within the memory of, say, our grandfathers.
>
> It is a very salutary corrective to this impression or assumption to glance back for a little upon the history of surgery in the past.

If any of us have acquired this impression or assumption, this paper may prove a salutary corrective such as that to which Prof. Young refers, but it was not with this high object that its preparation was undertaken but because of a much more lowly one. At one stage in his ascent of the Mountain of Purgatory, Dante reached a high terrace from which, while resting for a moment, he turned to the East and remarked to his conductor: "all men are delighted to look back," and from the terrace reached by the practice of cerebral surgery today I am delighted to look back and report the retrospect.

While the knowledge gained by the toil of one generation soon becomes the commonplace of the next, it is equally true that the discoveries of our forefathers have a habit of attaining a new importance many decades later. This is well exemplified in the history of surgical craniotomy. It will be seen that certain instruments used for performing the operation in quite recent years and even some of the most modern had their prototypes which were used by our surgical forefathers many decades before and were subsequently lost or forgotten.

In an introduction to an account of surgical instruments in Greek and Roman times, published in 1907, the author, Mr. J. S. Milne, remarked that prior to the publication of his essay, no systematic attempt to reconstruct the surgical armamentarium of the ancients had been made, that comparatively little attention had been given to this department of archaeology, and that literature bearing on it was scarce. If this applies to surgical instruments generally, it does so with greater force as regards those instruments appertaining to a particular operation such as opening the skull. A research into the literature has failed to reveal any systematic and comprehensive account of this aspect of the history of surgery so that the time seems opportune to present this brief history of the methods which have been practiced and the instruments used for opening the human skull during life.

PART I. NEOLITHIC

L'origine de la chirurgie cranienne se perd dans la nuit des temps.—VELPEAU.

Sir William Osler[78] described the modern operation of cerebral decompression as the oldest known surgical procedure, and it is certain that the operation of opening the skull during life dates back to the very dawn of civilisation. In all probability the operation was performed as far back as the Carnac Epoch of the Neolithic Period which is supposed to have ended in northwestern Europe about the year 2000 B.C.[123] That distinguished French neurologist and anthropologist, Paul Broca,[9,14] gave sound reasons for thinking that it was performed even before this, namely in the Campigny or Early Neolithic Period.

Many prehistoric human skulls have been discovered and continue to be unearthed with pieces of bone missing from them. The defects in the bone are due to various causes. They may have been produced by a deliberate operation performed during the life of the subject, and it is with holes so produced that this paper is concerned; but on the other hand they may have been caused by comminution, the result of violence such as that from spears or clubs; they may have been produced by disease during life, by defective development in early life, by post-mortem decay or injury by the picks or shovels with which the skulls were unearthed, or they may have been the work of necrophilous beetles, portions of the elytra of which were identified in connection with certain cranial openings around which a notable controversy[141] raged some years ago. From the types of opening known to result from each of these various processes, however, the nature of the bone destruction, and the fact that signs of reparation around the bony edges of holes produced some time before death are apparent after death, it is possible to recognise attempts made to remove bone discs from the skulls of the living. There are numerous examples of successful attempts so made upon neolithic skulls.

In the British Isles there are but few examples but France is rich in them,* many having been unearthed since 1865 when M. Prunières,[87,91] a medical practitioner of Marvejols in the department of La Lozère, first aroused interest in them by a discovery which he then made near Aiguières. In a dolmen there he found a human skull from which a large portion of bone had been removed. Part of the edge of the hole in this skull was polished and Prunières surmised that the skull had been used by a neolithic savage as a drinking cup, a custom not infrequent among savages, and that the bone edge had been worn smooth by the lips of drinkers from it. Broca[12] however pointed out that the polishing was really due to a healing process which during life had taken place in a wound made in the skull for removing a *rondelle* of bone. Prior to this it had not been realised that in prehistoric times our primitive ancestors used to remove discs of bone from the living skulls of their fellow tribesmen with implements made of stone. The effect of this startling discovery on contemporary thought can well be imagined, for it was not long before ample confirmation of Broca's hypothesis was forthcoming.

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* Some ideas of their frequency will be gathered from the fact that at Vendrest, 60 miles east of Paris, remains of over 120 individuals were found buried in a neolithic tomb and no less than 8 of the skulls had been opened during life and discs of bone removed therefrom. Badouin, M. Société Préhistorique Française. 1911.

Speculation next centered around the methods of making these openings in the skull and many and varied were the suggestions put forward to account for them. Lucas-Championnière[61] gave it as his opinion that they were made either by scraping or else by first drilling a series of small holes and then connecting these perforations by sawing or scraping. Sir Victor Horsley[49] from an inspection of the collection of skulls in the Broca Museum of Anthropology in the University of Paris, thought the openings had in most cases been made by sawing, possibly supplemented in some by scraping also, while more recently Dr. Wilson Parry, [119,123,124] after investigating the question very minutely and performing much experimental work relating to it, concluded that the openings were made with sharp flakes of either flint or obsidian used to scrape out a hole or to plough a groove in the bone until the gradually deepened groove ultimately perforated the skull and released a bony *rondelle*. Dr. Parry claims that boring a series of small holes and connecting these by sawing, the method suggested by Lucas-Championnière as that used for making the larger openings, is a very arduous procedure taking considerably longer to perform than what he calls "push ploughing" out a bone disc and that for this reason and also because of the absence, in his opinion, of any evidence of the bored holes in the great majority of the French neolithic specimens, he believes the usual method of performing the operation to have been the simpler furrowing out of a circular or oval groove with a sharp stone.

What were the possible reasons for producing these openings in the skull? In his treatise on Prehistoric Problems, Dr. Robert Munro[74] asks, "Were the motives that guided the hand of the neolithic operator inspired by therapeutic exigencies or by religious sentiments? Was the result of the operation to benefit the individual in this or in a future world?" Dr. Munro then proceeds to discuss these questions at length. It appears difficult to divorce therapy from religion especially in the days of primitive man. Probably the operation was most often performed as a religious or thaumaturgic rite applied to cases of epilepsy with a view to releasing supposed imprisoned spirits. Prunières believed that it was also performed for fracture, and from one specimen found by M. Gaillard[38] at Saint-Pierre de Quiberon, it appears that the neolithic surgeon also operated for the evacuation of abscesses following compound fractures of the skull. From his examination of the Broca Museum specimens, Sir Victor Horsley[49] even went as far as to suggest that the prehistoric surgeons had some idea of localisation of function in the brain since a number of the openings had been made over those areas of the brain which comprise the motor cortex, irritation of which gives rise to movements of the opposite side of the body and to other syndromes well known today.* Horsley's opinion however was not at the time nor has it since been generally accepted.

Support to the view that the cranial openings were in most cases made for religious reasons, is furnished by the discovery of numerous amulets made from bone discs or taken from perforated skulls in relation to openings in them, but although amulets occur in association with the neolithic skulls of France they have never been found in Peru where openings in neolithic skulls also are quite frequently encountered.[119] Since in the Peruvian skulls fractures are quite common it appears as if in that part of the world the operation had a basis more definitely surgical than religious.†

Although it is interesting to thus speculate upon the reasons why these operations were performed, the chief object of this paper is to review the methods which have been practiced and the instrument used to open the living human skull and so these reasons cannot be considered at greater length.

Today craniotomy is still performed in a most primitive manner in Northern Africa and among the Islanders of the South Pacific. The Shawiya surgeons of Algiers burn out a piece of scalp with a red hot iron ring mounted on a wooden handle, and then after drilling a few holes through the bone gradually saw out a disc. The operation may be completed at one sitting but is often performed in stages, a little sawing being done each day until the bone disc comes away. It sometimes takes the surgeon fifteen to twenty days to remove a disc about the size of a penny. Great care is taken to protect the brain and its membranous coverings, and to avoid the sutures since these are believed to be the patient's destiny written by the hand of Allah.[47,48] In the South Pacific also the skull is opened in an even more primitive manner for such conditions as headache and giddiness, for fractures, and even to promote longevity,[23] the bone being scraped out with a piece of glass. Shark's teeth were at one time used as the cutting tool

* In a visit paid to this museum in June 1929, I was unable to corroborate this. The openings appeared too irregularly placed in regard to the motor cortex and to be placed indiscriminately over the vault of the skull.

† Owing to the courtesy of Sir Arthur Keith and Mr. R. W. Burne of the Staff of the Royal College of Surgeons Museum in London, I have recently examined 14 specimens of primitive trephining from Peru. Two of the specimens show that the operation had apparently been performed for fracture. The size of some of these openings is considerable, and in several skulls two openings have been made. Several of the openings traverse the midline but evidence of healing shows that the superior longitudinal sinus had not been fatally damaged during the operation. There is no example of suboccipital craniotomy, and as far as I am aware no neolithic specimens from any part of the world afford examples of trephining in this frequent site of operation today. The Peruvian skulls have been trephined in front, over the sides and at the back. One skull shows evidence of infection and suppuration.

but today these have been replaced by glass.[30] The Museum of the Royal College of Surgeons of England contains two Melanesian skulls with defects in them due to operations performed in this rude manner, and from the fact that the bone edges show healing it is evident that these patients both survived the operation and lived for some time afterwards.*

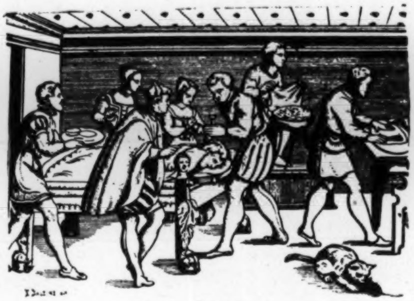

FIG. 1. MEDIEVAL CRANIOTOMY.

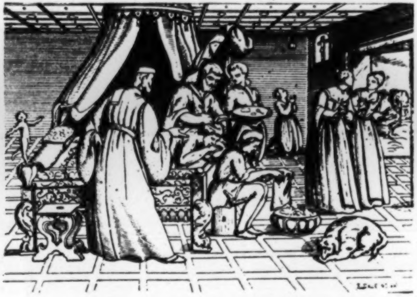

FIG. 2. MEDIEVAL CRANIOTOMY.

PART II. TREPANS OR TREPHINES

> It is possible, I think, that the more perfect methods of trephining practised by the hippocratic surgeons had a direct and continuous descent from the primitive operations of the stone age.
>
> —SIR CHARLES BALLANCE.

These are instruments which produce a cutting action by rotation. Examples are in use today, and although from the etymological point of view they would perhaps be better called trepans they are more commonly described as trephines.†

The trephine is a very ancient instrument. Hippocrates (*ca.* 400 B.C.) who had almost certainly obtained his knowledge from several sources, one of which was probably Egyptian,[19] described this instrument and laid down rules for its use, but to what literature he may have had access, is not known since pre-Hippocratic Greek medical writings have perished. It must not be thought that trephining was the only method used by the Greeks for opening the skull because Percival Pott[86] tells us that in some cases "the piece of cranium intended to be taken away was surrounded with perforations made at small distances from each other, and the interstices were cut through by chisel and mallet or by means of a scalper." This operation recalls a form of craniotomy occasionally practiced by the neolithic surgeons and by primitive races today (*vide* Section 1).

Hippocrates described the crown trephine (modiolus) which in consisting of a saw having a circular motion parallel to the plane of the skull is similar in principle to instruments in common use today. In referring to the method of using the trephine he mentions the desirability of occasionally plunging it in water to prevent the instrument becoming overheated. Apparently several sizes of trephine were employed in his time because he mentions a small instrument for use in head injuries in young people.

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* Specimens numbered 1172–11 (New Britain), and 1172–62 (New Ireland). The museum also contains other specimens from New Ireland 1172–63, 64, 65 and 66 and a "Trephined Anglo-Saxon skull," specimen 373–1, the history of which is not related.

† Trepanning. (Gr. *trypannon*, an augur.) Trephining. (L. *tres*, three, and *finis*, end, a word introduced by Woodall early in the seventeenth century when he gave the trepan a handle.) I am much endebted to Dr. Wilson Parry for calling my attention to the significance of these words.

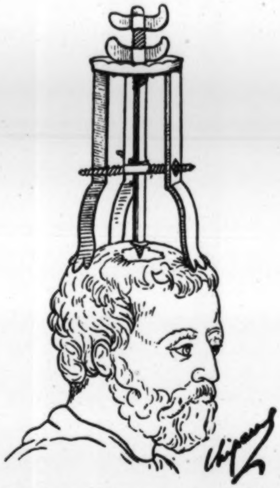

FIG. 3. MEDIEVAL CRANIOTOMY BY MEANS OF A MOUNTED TEREBRA. (FIGS. 1, 2, 3 AND 5 FROM CHIPAULTS' OPERATIVE SURGERY OF THE NERVOUS SYSTEM.)

In Galen's time (*ca.* 130 B.C.) the crown trephine appears to have been displaced by a gimlet type of instrument (terebra). This pointed trephine had a collar (abaptista) to prevent damage to the brain and its investing membranes by undue penetration through the bone. Apparently the distance of the collar from the point varied in different instruments so that a series of these trephines was kept in order to perforate thick or thin skulls.[19]

Evidently the Greek surgeons performed extensive craniotomies on certain of their patients because Paulus of Aegina[5] (early 7th century A.D.) refers to perforating the bone with these protected drills (abaptista) and then removing the bone not whole but in pieces with chisels.

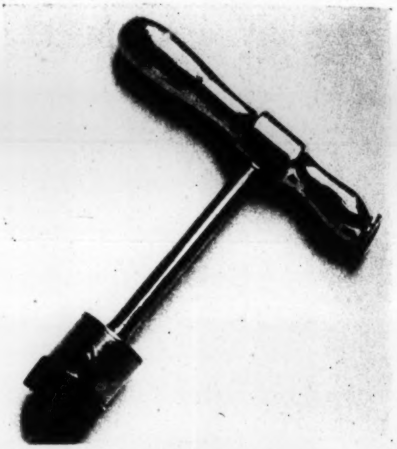

FIG. 4. SIR VICTOR HORSLEY'S TREPHINE, IN USE TODAY.

Over twelve hundred years after Galen, Guy de Chauliac (1363), apparently ignorant of the crown trephine, was still using the guarded gimlet type (abaptista)[45] (Fig. 3). The crown trephine appears to have been rediscovered by Bertapaglia in the fifteenth century and it was in use by Jean de Vigo in 1517.[19] It is interesting to note the way in which the crown type of instrument was made to bite the skull to commence cutting the bone disc. Celsus[5] (*ca.* 30 B.C.) refers to a removable center pin which is the device adopted in modern trephines such as Horsley's (Fig. 4), but in Jean de Vigo's time male and female instruments were used, the male trephine having a fixed center pin and being discarded for the female instrument as soon as the saw had commenced to cut into the bone. Although Horsley's trephine today is operated by hand with a screw motion, in the time of Celsus the trephine was driven by a throng, and following the re-introduction of the crown instrument, Berengar of Carpi in 1535 attached a brace to it to quicken and facilitate its action.[6] (Fig. 5). Recently (1928) a brace driven perforator with an adjustable collar to prevent undue penetration has been introduced into cerebral surgery by H. S. Souttar of London and may be regarded as a return of the terebra abaptista driven by a brace.[104]

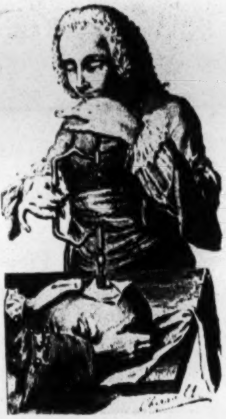

FIG. 5. TREPHINING BY MEANS OF A CROWN INSTRUMENT DRIVEN BY A BRACE. (17TH. CENTURY.)

In the works of "that famous chirurgion, Ambrose Parey,"[135] several trephines are depicted and described, also a "gimlet or piercer to perforate the scull before the setting to of the Trepan: A crown trephine and brace are illustrated fitted together and taken apart, and another instrument is shown with two triangular bits and a pin to hold them in the stocke." Still another illustration shows "a desquamatorie or scaling trepan" which closely resembles the modern brace and center bit (Fig. 6).

Towards the middle of the eighteenth century the crown trephine was improved somewhat by making the cutter slightly conical instead of perfectly cylindrical, in this way contributing to the ease with which the bone disc could be elevated after cutting through the skull, and while cutting the bone lessening the chances of damaging the underlying membranes covering the brain. This modification can be seen by comparing the trephine made by Savigny with that designed by Sir Victor Horsley. Savigny's instrument, introduced about 1798,* had a barrel of cylindrical pattern (Fig. 7) while that of Sir Victor Horsley which remains in use today resembles a truncated cone (Fig. 4).

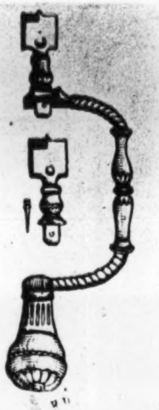

FIG. 6. BRACE AND CENTER BIT TREPHINE OF AMBROISE PARÉ.

Both crown and gimlet trephines have thus been in use with only minor modifications for over two thousand years, but while the crown type of instrument was lost for some time, it eventually reappeared and today is in more common use than the gimlet or center bit type of instrument. From the time of Hippocrates trephining appears to have been carried out for surgical rather than thaumaturgic reasons. Fracture of the skull however was not the only indication for the use of the trephine. Hippocrates trephined and decompressed to relieve failing vision, the result of rising intracranial tension, in much the same way that a modern decompression is performed for the same purpose, and Celsus[5] (*ca.* 30 B.C.) recommended trephining for meningeal hemorrhage without fracture of the skull. But, as mentioned in the previous section, the object of this paper is rather to describe the methods and instruments used for opening the skull than to discuss in detail the reasons for operating. Trephining was very readily resorted to in the sixteenth and seventeenth centuries for we read that as a result of a fall from his horse Philip of Nassau was subsequently trepanned by "Henry Chadborn, Surgeon in Nymegan," no less than twenty-seven times.[136]

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* Three good specimens of this instrument can be seen in the Museum of the Royal College of Surgeons of England. They are catalogued as K 14, K 15, K 16 in the instrument room.

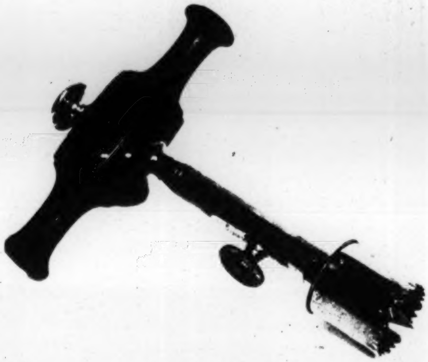

FIG. 7. SAVIGNY'S TREPHINE.

PART III. SAWS

The past is always with us, never to be escaped; it alone is enduring; but, amidst the changes and chances which succeed one another so rapidly in this life, we are apt to live too much for the present and too much in the future.

Aequanimitas—OSLER

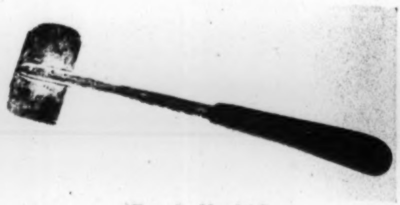

FIG. 8. HEY'S SAW.

The crown trephine may be regarded as a modified continuous hand saw bent on its flat into the form of a circle. Saws of many varieties have been used in cranial surgery, the most primitive being the serrated shark's teeth and jagged pieces of flint and obsidian referred to in Part I of this paper. Following the introduction of metal saws, two kinds of saw were evolved. The first and simpler of these was the hand saw, the second the circular or disc saw which, since it required some driving mechanism to operate it, may be called the mechanical saw.

The Hand Saw. The best known model of the hand skull saw is that widely called Hey's saw (Fig. 8) and used about 1780 by Mr. William Hey, F.R.S. of Leeds, He, however was not the originator, for in his "Practical Observations in Surgery"[46] published in 1803, and in a chapter dealing with fracture of the skull he thus writes of this saw:

> It was first shewn to me by Mr. (now Dr.) Cockell, an ingenious practitioner, at Pontefract, to whom the public is

indebted for the discovery, or revival, of this excellent instrument. A saw, formed on the same principle, is represented in Scultetus's armamentarium chirurgicum; but I understood Dr. Cockell to say, that the instrument which he shewed me was of his own invention, and that he had used it with great advantage in extensive fractures of the skull. Dr. Cockell's saw had a semicircular edge, as represented in the annexed Plate, where the size of the figure is two-thirds of the real dimensions of the instrument. But the edge may be made straight (as is shewn in the Plate) or of any degree of convexity which may be thought most useful.

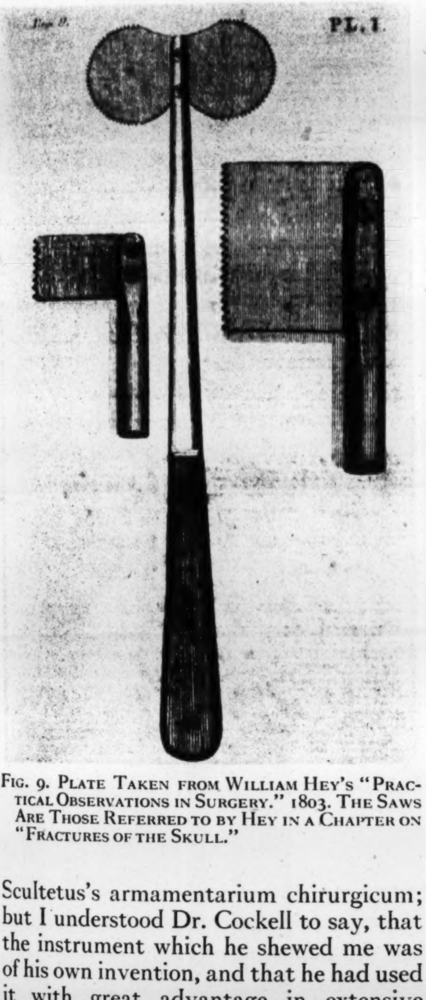

FIG. 9. PLATE TAKEN FROM WILLIAM HEY'S "PRACTICAL OBSERVATIONS IN SURGERY." 1803. THE SAWS ARE THOSE REFERRED TO BY HEY IN A CHAPTER ON "FRACTURES OF THE SKULL."

There is a footnote stating that the saws represented in this Plate (*vide* Fig. 9) were made by Mr. Savigny in London. But long before the time of either William Hey of Leeds or Mr. Cockell of Pontefract, saws of this type had been used for opening the skull. Ambroise Paré[135] depicts several which he describes as "saws fit to divide the scull"* and these closely resemble Hey's saw, and Andrea a Cruce[24] has a picture of a saw which is also very similar to that of Cockell and Hey (Fig. 10).

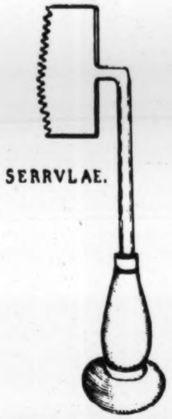

FIG. 10. HAND SAW AFTER ANDREA OF CRUCE. (FROM CHIPAULT'S OPERATIVE SURGERY OF THE NERVOUS SYSTEM, 1894.)

Although Hey was not therefore the inventor of the saw named after him he did draw attention to this type of saw and emphasized its advantages in cranial surgery, and as Sydney Smith says, it is not the man who first says a thing, but it is he who says it so long, so loudly and so clearly, that he compels men to hear him: it is to him that the credit belongs. So far as his own country is concerned, then, the credit of thus emphatically demonstrating the value of hand skull saws belongs to William Hey of Leeds.

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* *Vide* reference to Ambroise Paré on p. 509. The illustration occurs on p. 345 of Paré's works.

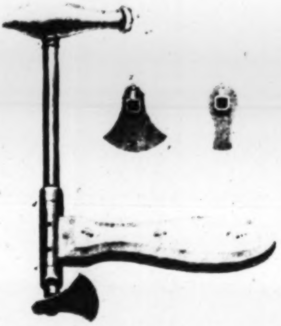


FIG. 11. PROF. THAL'S ROTATION SAW. (FROM *Edinb. M. & S. J.*, 1823.)

On March 1, 1878 at a meeting of the Surgical Society of Ireland, Dr. L. Bigger showed a saw like Hey's but with teeth also on the concave side so that both the convex and concave sides of the cutting blade could be used. In claiming advantages for hand saws such as Hey's and his modification of it, Bigger said:

> . . . various attempts are to be found in the records of ancient armamentaria, of very near approaches to the short saws brought into use by that excellent surgeon, Mr. Hey of Leeds. He, practising in a district where powerful machinery was continually causing fearful fractures and injuries, felt that the trephine was not always competent to fulfil the intentions of the surgeon and he designed the saws known by his name.

During the discussion which followed the presentation of Dr. Bigger's paper, the President of the Society, Robert McDonnell, F.R.S., agreed with Mr. Richardson, one of the speakers, that "there had been a good deal of claim for novelty for surgical saws which had long been in use for instance by ivory turners for cutting round corners and so on."[162]

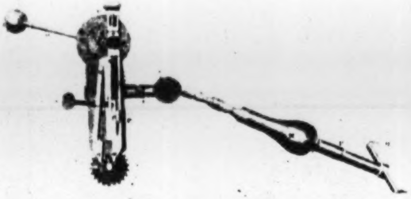
It seems highly probable that small saws mounted on handles were in use for many purposes long before Bigger, Hey, Cockell or even Ambroise Paré drew attention to them.

Mechanical or Rotation Saws. Early in the nineteenth century a number of circular saws variously mounted and driven came into use for cutting bone, and some of these were applied to cerebral surgery. The simplest of these instruments was that of Prof. Thal,[137] first surgeon to the Copenhagen Hospital for the Poor (Aemindelig). A description of Thal's saw with a plate (Fig. 11) appeared in the *Edinburgh Medical and Surgical Journal* for January 1, 1823. From the plate it can be readily seen how the instrument worked: blades either completely circular or sections of circles and of various sizes could be fitted to a shaft which was rotated by one hand of the surgeon, while his other hand supported the whole instrument by a handle upon which was mounted the main bearing through which the shaft passed. Apparently Thal was both ingenious and versatile because in 1823 Prof. Howitz commenting upon this saw observed, "In its present form, the whole instrument has also been executed by the inventor, who is almost as skilful in such workmanship as his countrymen acknowledge him to be in the principal object of his studies."[137]

Numerous other disc saws, all however more complicated than that of Prof. Thal, appeared at this time but of these not one has survived to be used in cranial surgery today, that is to say they have all been complete failures. Some proved little more than inventor's toys and never came into use at all, others had an ephemeral existence; all proved either too cumbersome or too complicated or dangerous and inefficient for general usage. Some very ingenious mechanical saws were produced, however, and an examination of some of these in the instrument collection in the museum of the Royal College of Surgeons in Lincoln's Inn Fields proves a fascinating occupation.

In May 1808 Mr. Machell,[63] a surgeon of Wolsingham, communicated to the *Edinburgh Medical and Surgical Journal* a description and a drawing of a circular bone cutting saw.[63] An editorial note commenting on the saw reads as follows: "We have examined it, and we think it remarkably ingenious. It is so far as we know the first contrivance whereby a circular saw is enabled to cut deeper than its semi-diameter, an advantage of incalculable importance in the operations for which it is intended." Figure 12 is taken from the plate of Machell's saw, and an example of the instrument can be seen among the collection previously referred to, in the Museum of the College of Surgeons.*

Machell considered his saw specially suitable for clearing the ends of old ununited fractured bones, but it is conceivable also that attempts to use the instrument for cranial surgery may have been made, because he refers to the value of a joint "which will allow of the conveyance being formed into different angles, which is frequently particularly necessary in applying the annular saw to the convexity of a patient's head, as in cases of fractures of the cranium,"[63] and again, "at the end of the forceps I have added two small points, which are found very useful in applying the saw to the cranium."[63]



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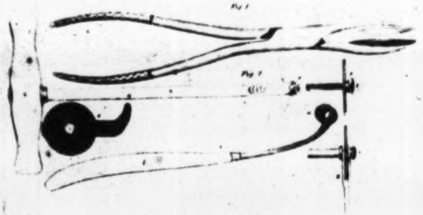

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FIG. 12. MACHELL'S SAW. (FIGS. 12 AND 13 FROM *Edinb. M. & S. J.*, 1815.)
FIG. 13. SAW AND BONE NIPPERS OF MR. GRIFFITH

In 1815 Charles Griffith, Surgeon to the Forces, produced a circular saw which in conjunction with "a new form of bone nippers" was communicated to the *Edinburgh Medical and Surgical Journal* by Dr. R. Hall[138] of the Detached Military Hospital at Chelsea with the following rather ponderous introduction:

> The military practice of surgery, embracing a greater variety of casualty than any other, owing to the fortuitous passage of balls through, or their lodgement in, every part of the body, urging military surgeons occasionally to the exertion of their inventive faculties, for the purpose of preserving life, relieving pain, or avoiding as much as possible, a too sanguinary use of the knife, it becomes, I think, a duty which they owe to their profession in general, to make public such matters as they have reason to believe may prove of public utility.

Mr. Griffith refers to the possible

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* Specimens, K 53, K 54, and also K 55 which is a modification of a Machell's saw by the addition of forceps to hold the bone.

use of his saw in cranial surgery but there is no record that the instrument "proved of public utility." (Fig. 13.)*

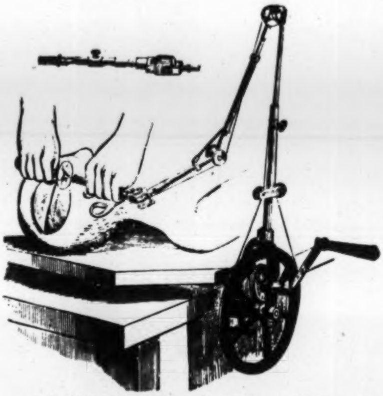

Fig. 14. Sir Victor Horsley's Saw. (Figs. 14–16 by Courtesy Messrs. Mayer & Phelps.)

About the time of the appearance of the saws of Machell and Griffith, a number of mechanically operated disc saws were produced in France but none seems to have become established as a practical instrument for use in cranial surgery.

The mechanical saws that have been referred to were devised for cutting bone generally, and although it was thought by the designers of certain of them that they might be used for opening the skull not one of these saws was especially designed for this purpose nor did any come into use in this way.

The great pioneer of cerebral surgery, the late Sir Victor Horsley, realised the desirability of having a rapid mechanical method of cutting through the cranial bones, and his biographer, Stephen Paget, writes:[143]

. . . So early as 1887 he added, to the use of the trephine and the bone cutting forceps, the use of a minature circular saw driven by a Bonwill's surgical engine [Fig. 14]. This was apparently the first mechanical saw designed for the special purpose of opening the skull but apparently Horsley did not find the instrument very successful, and it was not very long before he abandoned it. Sir William Macewen in Glasgow was using a circular saw for performing craniotomy about the same time as Horsley was using his in London, but Macewen was not pleased with this method of opening the skull and cautioned against the use of circular saws for the purpose.

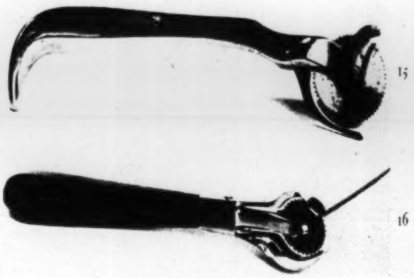

Fig. 15. Doyen's Saw.
Fig. 16. Van Arsdale's Saw.

Doyen in Paris introduced a circular saw for cranial surgery in 1897* (Fig. 15) and in the same year William Waldo Van Arsdale, adjunct professor of surgery at the New York Polyclinic, published a paper entitled, "Remarks on Temporary Resection of the Skull by a New Method with a Report on Three Successful Cases."[111] This new method consisted of the use of a specially constructed disc saw which Van Arsdale had presented (Fig. 16) to the New York Surgical Society the year previously when he also published an account of the instrument.[110]

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* The museum of the Royal College of Surgeons of England contains 3 examples of Machell's saw, specimens K 53, K 54, K 55, and examples, specimens K 51, K 52, of formidable clockwork driven instruments, the diameter of the saw of one of these being 4¾ inches.

* I am indebted to Messrs. Meyer and Phelps for kindly lending me the saws from which figures 14, 15 and 16 are made and for kindly writing to Messrs. Collin of Paris for me about Doyen's saw. The following reply was received. "*Nous avons l'avantage de vous faire connaître que la scie du Dr. Doyen a été construite par nous et présentée à la Société de Chirurgie vers l'année 1897.*"

Horsley's, Doyen's and Van Arsdale's saws were all driven by surgical engines connected to the driving spindles of the saws by flexible cables.

It is interesting to note that of all these varieties of skull saws, the only one to remain in use today is the simple hand instrument known as Hey's saw.

PART IV. FURTHER ADVANCES IN TECHNIC: THE FORMATION OF BONE FLAPS.

> I feel the great thing in this world is not so much where we stand, as in what direction we are moving.
>
> —OLIVER WENDELL HOLMES

> By the historical method alone can many problems in medicine be approached profitably. For example the student who dates his knowledge of tuberculosis from Koch may have a very correct, but he has a very incomplete appreciation of the subject.
>
> —SIR WILLIAM OSLER

One of the greatest advances in the method of opening the skull for surgical exploration of the brain and its investing membranes was that made in 1889 by Wilhelm Wagner of Königshütte.

In 1864 Ollier had suggested an osteoplastic resection of the skull, his idea being to lift up a piece of the skull adherent to a flap of soft parts,[22] but it was not until 1889 that Wagner first adopted this principle when operating upon the living subject.

On November 23 of that year, Wagner reported the case of a patient upon whom he had performed osteoplastic craniotomy, and entitled his paper "On temporary resection of the vault of the cranium in place of trepanation."[115] The operation had been performed on October 3, 1889 upon a laboring man aged twenty-seven, who was unconscious following a blow on the side of the head, and who two days after the accident developed signs and symptoms pointing to intracranial hemorrhage from the left middle meningeal artery. Wagner, who had previously experimented upon cadavers with the object of producing a bone flap attached at its base to the soft parts so that the flap could be turned down, a reasonably large area of the brain exposed and the flap subsequently replaced, now performed his operation for the first time on a living subject. A large bone flap was chiselled out and turned down with its base attached to the scalp, the bleeding meningeal artery secured and the flap replaced. Wagner's patient died twenty-four hours later, but the operation had introduced a new technic in the surgical exposure of the brain, and it was not long before other and more successful attempts were carried out. Osteoplastic craniotomy has now come to be known as Wagner's operation.[139]

At the time of his original description Wagner stated, "I only use small strong chisels and elevators. Perhaps some form of circular saw could be constructed which could be set in motion after the manner of a dentist's drill with which it would be possible to work more quickly and accurately." He added a word of warning against the hammering necessary for chiselling, and the liability to cerebral concussion from hammering the skull is of course obvious.*

Wagner was apparently unaware of Horsley's circular saw because he concluded his suggestion to use such an instrument by stating that he did not know of such a saw, and then when his paper was in print added a footnote, that Richter had told him of a circular saw constructed by Collin of Paris and used by Péan and Ollier.[115] This was apparently Doyen's saw to which reference has been made in the previous section.

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* Gorodiski, Ein Vorschlag zur Trepanation, Erlangen, 1893, commenting upon this states that for this reason the use of hammer and chisel for opening the skull was deprecated by Galen about 200 A.D.

Circular saws as constructed towards the end of the nineteenth century, however, did not prove very helpful in performing osteoplastic resections of the skull, and the most useful instrument introduced for this purpose was the wire saw of Leonardo Gigli of Florence. This instrument, now universally known as the Gigli saw, was first described in 1894[39] and rapidly came into general use. It consists of a flexible roughened wire operated by detachable handles at either extremity, and serves to cut through bone in much the same way that a plain wire cuts through cheese. The saw is used to divide the intervening bridges of bone separating trephine or other openings made into the skull, and is similar in action to certain old chain saws which were introduced in the eighteenth and nineteenth centuries for cutting long bones.

Gigli saws are in use today not only for performing osteoplastic craniotomy but also for cutting through bony bridges, the situation of which renders the application of other saws hazardous or difficult. Cutting bone flaps from the skull by means of these saws is tedious and the wires may jam or break, but the procedure is a safe one.

The production of osteoplastic flaps is an essential part of cerebral surgery today, and since Wagner's time the chief advances in the methods of opening the skull and in the instruments for the purpose have been in the direction of improving the technic of performing this operation. Many craniotomes have been invented to facilitate the Wagnerian operation, but none so far has been sufficiently successful to supplant Gigli's saw completely and relegate it to places similar to those held today by the saws of Thal, Machell, Griffith and others to whom reference has been made.

At the seventh Congress of the International Society of Surgery held in Rome in April 1926, Dr. A. Jentzer of Geneva, suggested cutting bone discs completely from the skull and replacing these later. He showed and demonstrated the action of an elaborate instrument which he had designed for this purpose, and which consisted of a central trephine around which other trephines fitted concentrically so that a series of cuts could be made through the skull, and discs of various sizes removed and preserved until the completion of the operation when they could be replaced in the gap in the bone.

Most surgeons however still prefer to perform the Wagner operation of turning down a bone flap attached to the soft parts, and the problem which this type of operation presents is how best to make the linear cuts through the bone. Forceps such as those of De Vilbiss have been used, electrically driven instruments which punch out a groove through the bone in much the same way that a pneumatic drill cuts a groove through a hard road, have been introduced by Dr. De Martel* of Paris and others, and an ingenious instrument has quite recently been designed and used by Mr. H. S. Souttar of London. This instrument is operated by hand and by swinging round an expanding mandril fitted through an opening in the center of the proposed bone flap cuts a flap which is part of a circle.[104] Mr. Souttar's craniotome is particularly interesting inasmuch as it is a modern counterpart of a similar type of instrument described by Ambroise Paré in 1634 as "a paire of cutting compasses to cut forth the scull"* (Fig. 17), and well illustrates the tendency for certain discoveries of our forefathers to be lost for a time and rediscovered many decades later.

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* The instrument which I have seen used by Dr. De Martel in Paris appears to have had a precursor manufactured by De Vilbiss of New York and pictured by Terrier, *Gaz. hebdom. de med. et chir.*, 31: 573, 1894.

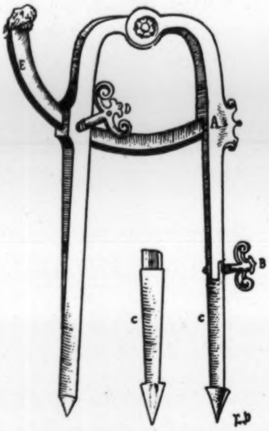

FIG. 17. AMBROISE PARÉ'S SKULL COMPASS. (COURTESY PROF. R. DOBBIN.)

Mr. Souttar's instrument consists essentially of a hand driven cutting tool acting from a center pin. In 1893, Sir William Arbuthnot Lane, then assistant surgeon to Guy's Hospital, read a paper on "The applicability of the parting tool or angular gouge to the surgery of the skull," and for opening the skull advocated the use of two carpenter's parting tools of different gauges and so ground that one was more suited to the thicker dense skull of the adult, and the other to the less resistant skull of the child.[53] In the following year J. S. Pyle published a paper "On opening the cranial cavity with a new set of instruments."[96] The instruments were hand operated cutting tools and a report of a case was included in his paper, but today these hand operated tools have, except in the case of Souttar's mechanical craniotome, almost completely disappeared from cranial surgery.

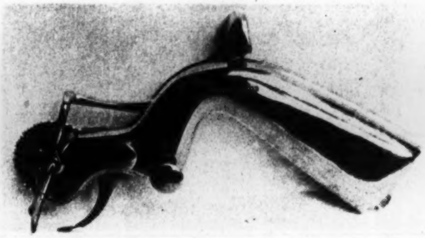

FIG. 18. THE "SKULL PLOUGH," A MODERN ELECTRICALLY DRIVEN CRANIOTOME.

Doyen's, Van Arsdale's and other circular saws have not been successful for performing osteoplastic resection of the skull, and an examination of these instruments shows that the reason for their failure appears to be the difficulty of engaging a power driven saw with the skull while at the same time adequately protecting the brain and its membranes from injury. An attempt has been made to get over this difficulty in a recent instrument by the introduction of a cutting action capable of accurately controlled biplanar movement in relation to a guard for the brain and its membranes (Fig. 18).* It remains for time to classify this instrument either with those of Thal, Machell, Griffith, Horsley, Doyen and Van Arsdale, or with the more successful saws of William Hey and Leonardo Gigli.

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* I am much indebted to Prof. R. Dobbin of Cairo, for drawing my attention to this ingenious instrument and for very kindly sending me drawings of it. I have since compared them with the original and written to Mr. Souttar pointing out to him the similarity between his and Paré's instrument.

* The Skull Plough, a new instrument for cutting cranial bone flaps (Fig. 18). Reported

CONCLUSION

In this account of craniotomy and the instruments used to perform it, an attempt has been made to show how from the very earliest times man has operated upon the skulls of his fellows, using at first sharp stones or shark's teeth* to cut an opening through the bone, then various metal instruments in the form of trephines and saws; how with progress through the ages these became elaborated so as to facilitate the cutting process and make it more rapid; how certain of the elaborations failed while others evolved, and how with the wide application of mechanical power, power driven instruments in certain cases supplanted those operated by hand. Certain of these instruments had an ephemeral existence almost as transient as Jonah's gourd, which "came up in a night, and perished in a night," others remained for relatively long periods ultimately to pass away or become so modified as to be no longer recognisable, while still others have persisted and are in use today.

Throughout this, as in most stories of development, two tendencies are apparent, first that certain ideas and methods may recur over long intervals, so that the discoveries of our forefathers become lost for a time and reappear long years afterwards, and secondly that the toil and trials of one generation may become the commonplace of the next, sometimes abruptly sometimes so insidiously as frequently almost to escape observation.

The distribution of the operation of craniotomy with respect to time, territory and the stage of development of races shows that the operation is common to many countries and to different stages in the development of mankind, from the unwritten past to the present and from savagery to civilization, and that the methods of, and probably the motives for, its performance have varied widely with cultural progress.

The story of the methods which man has practiced and of the tools, which, throughout the ages, he has used for opening the skulls of his fellow men, not only throws odd shafts of light on the condition of races at various stages in their evolutionary progress, but also affords fleeting glimpses of progressive stages in the social development of civilized man, "a tool using animal," as exemplified by the nature of his tools.

In glancing back at these stages, however, it must not be forgotten that progress is only rarely made by sudden steps; more often it is along a gradient so gentle as to be almost imperceptible and between the stages there are many intermediate ones that tend to be overlooked. We may do well to remember what Carlyle has said about history in general:

> The most important part is lost without recovery, and, as thanksgivings were once wont to be offered for unrecognised mercies, look with reverence into the dark untenanted places of the past, where in formless oblivion many of our chief benefactors, with all their strenuous endeavours, lie entombed.

and in this spirit I conclude this brief account of the history of craniotomy.

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by Lambert Rogers on July 24, 1929 to the Surgical Section of the British Medical Association at its annual meeting in Manchester.

*As is well known, sharks' teeth are serrated.

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AN ANCIENT SYPHILITIC SKULL FROM PARACAS IN PERU

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ARCHEOLOGY*

IN July, 1925, accompanied by Dr. Samuel K. Lothrop of the Museum of the American Indian, I visited the ancient cemeteries that are found south of the port of Pisco, near the shore of the Bahia de la Independencia (Fig. 1). Close by are certain shell-heaps, that arise in a series of mounds along the bay. Pottery and fine cloths, that used to be sold in Pisco, have been taken from these cemeteries, and loose fragments from the plundered tombs, consisting principally of human remains, are found scattered over the surface.

Some 3 km. from the place where San Martin disembarked on September 7, 1820, during the war for the independence of Peru, today called by the fishermen La Puntilla, and about 18 km. south of the present port of Pisco, contiguous to the depression or neck of the Peninsula of Paracas, are found two sites of exceptional importance to archeology. One of these is on the extensive bench or table-land that rises to the east of the bay, in the direction of the axis of the peninsula, which is formed of fossiliferous tertiary deposits. The other site lies in the hollows of the *cerros* or hills of red porphyry covered by thick deposits of clay, that rise towards the south. The first is known by the fishermen as Cabeza Larga from the elongated human skulls that abound on the surface and the second by the name of Cerro Colorado, from the red color of the porphyry (Fig. 2).

At Cabeza Larga, Dr. Lothrop and I recognized some fragments of embroidered cloths, of a style identical with that of certain embroidered robes preserved in various Peruvian and foreign museums, regarded as coming from Nasca, and which on account of their beauty and color have been much admired. And at Cerro Colorado I recovered in a few minutes a collection of trephined and deformed crania left scattered on the surface by the *huaqueros* or tomb robbers.[1] They particularly called my attention both to the frequency (45 examples) and to the special type of deformation that the skulls presented, different from the types known along the coast up to that time; also to the terrific surgical trepanations that the majority of them exhibited.

Impressed by the importance of the remains found after these few hours of exploration, in the following months I undertook investigations directed towards the discovery of the tombs. At Cabeza Larga, I encountered, at a slight depth, accumulations of bodies wrapped in rags, buried in the sand or within rectangular, subterranean structures with walls made of stone and clay mixed with seaweed. The mummy bundles were of different sizes, in general of conical form; the cloths were much burned and the bodies all had deformed heads, of a high elongated type somewhat resembling the Aymara, and had been mummified by the use of heat or smoke.

The low mountains or hills of Cerro Colorado have a red color, more intense on the summits than in the valleys, where gray and yellow, which come up to the base, take the place of the red. The study of this formation suggests the hypothesis that an elevation of the bed of the ocean has taken place, which raised the sedimentary fossiliferous layers below, and through them protrudes the porphyry mass which today forms the peaks of Cerro Colorado. Thus the stratum of clay covers the folds and depressions of the summits. In the folds it is much thicker, and in it, what are obviously different portions or layers may be distinguished: a superior one of shale or clay, homogeneous, compact and grayish yellow, and an inferior layer of clay that easily breaks into lumps, mixed with marine salts and crystals of a gray or lead color. This stratum has been covered by a cap, of variable thickness, of sand transported by the wind, pure or nearly so on the summits, and mixed with powdered clay in the folds and hollows. The surface of the sand is sprinkled with red particles produced by the disintegration of the red porphyry of the peaks.

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* Dr. Tello.

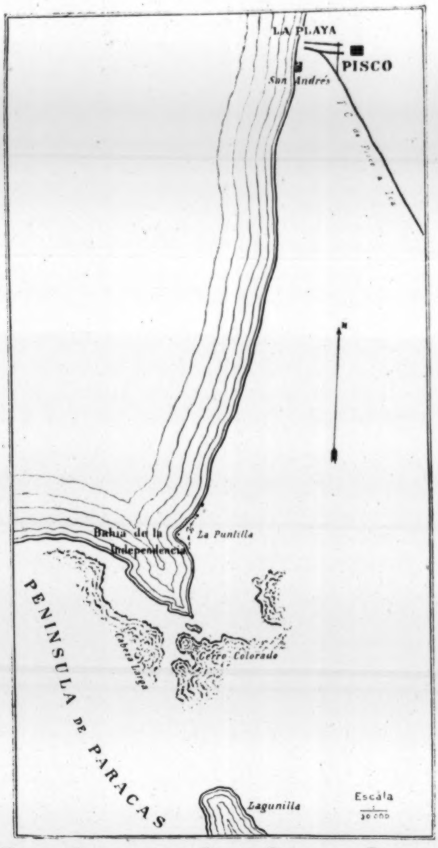

FIG. 1. LOCATION OF CERRO COLORADO. PORT OF PISCO ABOUT 110 MILES (177 KM.) SOUTH OF LIMA.

In November of the same year I attempted to find the tombs which I thought ought to exist in the hollows of Cerro Colorado. The first investigations carried on there did not give results. After we removed the superficial layer of sand, as thick as one to two meters at some points, a layer of hard clay was reached. In the superficial layer were encountered human remains, fragments of textiles, of pottery and of other products of human industry, of a style till then unknown to me. Some of the bones, in spite of being below the sand, were bleached by the sun, which led me to suppose that these remains had been transported by the action of the powerful winds or *paracas* which frequently blow in this region, or perhaps had been taken from the tombs by the *huaqueros* and treasure-hunters, or by the foxes which are common in these parts.

Only after having made many attempts in almost all of the hollows and folds between the ridges, extending over several days, was I able to find tombs below the superficial layer of sand. First I discovered a small cavern in the elevated hollow (Cavern 1), and a little later caverns numbered

II, III and IV, that had been dug in the hard earth of the subsoil. The perpendicular construction of these caverns from above downwards did not permit me to form a clear conception of their general type. In the superficial layer I met with human bodies, some completely wrapped in cloths, and others separated and in fragments and apparently buried and thrown in at random in the layer of loose sand mixed with fragments of stone. This led me to suppose that having filled up the tombs built in the hard earth, they continued piling bodies above them, or perhaps fresh bodies replaced the old ones and these were left on the surface. It was therefore very difficult to observe the disposition of the bodies during the work of exploring the caverns. The workman necessarily dug while stepping upon the bodies piled within, sinking to the bottom and producing confusion. Single human bones, and remains of their wrappings were found constantly in the course of the excavations, from the superficial layer to the very floor of the caverns. This difficulty obliged me to change the procedure in opening the caverns.

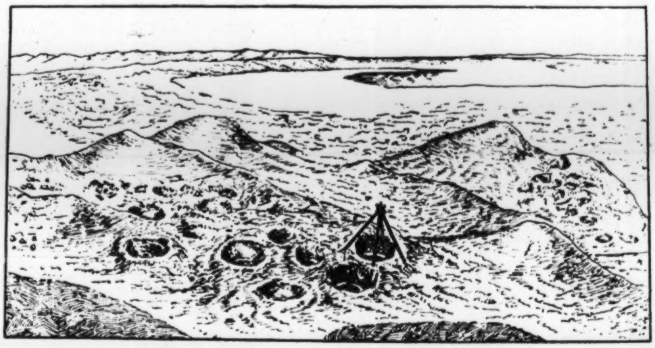

FIG. 2. POSITION OF TOMBS ON CERRO COLORADO. DERRICK OVER VESTIBULE OF TOMB 5.

I proceeded from Cavern IV in order to explore the neighboring Cavern V, working upon that from below upwards. For this purpose I made a tunnel in the north wall of Cavern IV which permitted me to penetrate into V and to observe its contents by the light of a lantern.

Like the other caverns this one (Fig. 3) had been excavated in the lower layer of clay. In section it had about the outline of a carafe or a bottle. Below it had a kidney shape with a long diameter of 3.4 m. running from north to south. Its height was 1.30 m. In the middle was a pyramid, made of a pile of bodies and sand. At the sides were bodies wrapped in cloths, placed in pits or niches dug in the rock proper. In the central and upper part of the cavern, like the neck of a bottle, was a cylindrical outlet or tube, passing through the layer of compact clay to the exterior. In this tomb the tube was about 1.66 m. in height, with a maximum diameter of 1 m. at its lower opening, and a diameter of 0.75 m. at its upper opening. On the walls of the tube small depressions had been made, intended no doubt, to facilitate entrance and exit. The upper aperture of the tube was covered or obstructed by a kind of roof or ceiling made of bones from the whale, of seal skins and mats held down by stones. In

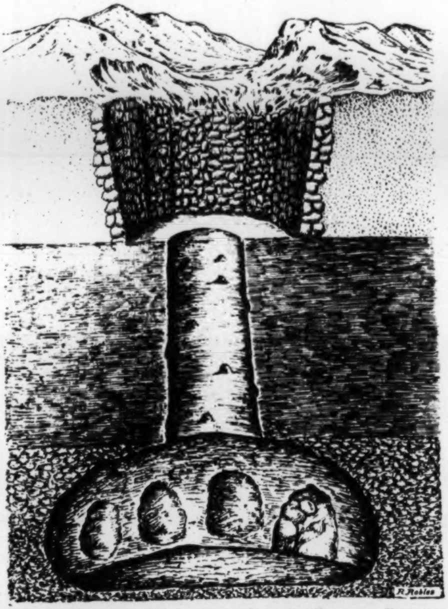

FIG. 3. TOMB 5. VESTIBULE ABOVE, CAVERN BELOW, THE TUBE CONNECTS THE TWO.

order to avoid the falling of sand through the roof, this was repaired at certain points, and the removal of the contents of the cavern was accomplished by way of Cavern IV. From Cavern V forty-eight bodies of men, women and children were taken, with various objects corresponding to the peculiar culture of the locality, a culture that, as will be seen later, antedates that of Nasca, and therefore also that of the Incas.

Furthermore, seven skulls, all of adults and men of mature age, showed trepanations. All of the heads were deformed, and in some individuals the complete apparatus for deformation was preserved. All of the bodies were wrapped in cotton cloth; with them were bowls made from gourds, and some had vessels of the style peculiar to this culture, of fine black pottery, with incised patterns and painted with coarse pigments in lively colors, red, yellow and green. Close to them were found the same class of objects as were encountered in the other caverns and on the surface, consisting of small ceremonial racquets, cloths embroidered with apparently mythological figures, knives of obsidian, of different sizes and forms, and so on.

Having removed the contents of the cavern, I proceeded to take away the upper layer of sand that concealed the tomb. Over an area of a little more than four meters square and at a depth of one meter I met with a fine layer of clay or sand, hardened probably by the night mists of the sea or by the crystallization of the salts from the sea water that the entombers may have poured over the graves. This layer was supported by a circle of stones that formed part of the enclosure or vestibule of the tomb. In the sand removed I found fragments of cloths and fragile human bones, partly eroded, and whitened by the action of the sun.

Having taken away the hard layer of sand or clay and having removed the pulverized soil mixed with sand and having a strong odor of guano, that completely filled the vestibule, the latter now exhibited a rather prismatic shape, with angles very obtuse or curved; it measured 1.50 m. in height, 2 m. in length, and 1.15 m. in breadth. The wall was formed of stones of hard rock and of clay. From here I took six nearly complete bodies; five of adults or aged persons and one infant. They were placed in no particular order and at different levels: one pointing to the east, another to the south, two to the west; another whose wrappings were preserved entire lay at the northeastern edge of the mouth of the tube close to the body of the infant. No one of the skeletons was complete. Many bones were pulverized, and long bones in part broken and in disorder were lying on the southeastern side. At the bottom of the vestibule and close together, I found two long bones, a left tibia (12/7509 A) and a left humerus (12/7509 B) with evident pathological lesions. This find obliged me to examine the other bones most carefully; as some of them exhibited erosion and whitening as if at some time they had been exposed to the elements, I extended my exploration of the superficial layer in the places contiguous to the cavern, principally towards the northwest. An elevation appeared in that direction having an extent of about 5 m., and there I found many single bones and other objects similar to those found within the caverns. One of the first finds of this small and rapid investigation was the cranium with pathological lesions (12/7509 C). Close to the cranium were two femurs, the ulna, (12/7509 D-F) a sacrum much eroded, the pelvic bones, and a plate of gold in the form of a five-pointed star. The cranium and the three long bones showed lesions like those of the tibia and humerus from the vestibule. Although I continued the excavations, both as to width and depth, I found no other bones with this class of lesions.

The pathological bones thus encountered, in my opinion, form part of one body, which was originally buried in a cavern. All of the bodies met with inside the caverns have one and the same type of cranial deformation and are associated with one and the same class of ethnological objects. The kind of deformation characteristic of the crania of the caverns is cuneiform, brought about by the use of a special apparatus, found repeatedly in the caverns, sometimes in position on the very head of a body in a cavern. This apparatus did not produce the type of deformation seen in the people of Nasca, elongated, flattened at the forehead, projecting at the occiput, nor the circumferential type of deformation of the Aymaras, nor that of the high deformation which more nearly approximates that of the people of the Cabeza Larga, and still less to the type of deformation of the Muchik or Chimu, all of them pre-Columbian and all of later date than that of these caverns.

The pathological skull here referred to belongs to the type of the Cabeza Larga. The ethnological objects found close to it or about it in the superficial layer are similar to those found in the caverns, such as the gauze and cloth, the embroideries, the plates of gold, the knives of obsidian, the little racquets of unknown use, the tubes of bone for the inhalation of snuff, the fragments of pottery; in short all that defines this culture as different from the others, whether Andean or littoral.

The people of the caverns left great quantities of rubbish full of fragments of their characteristic pottery, which cover the ancient structures. At a later date these layers of rubbish were cut into and a large excavation made in order that the people of that time might be buried there, wrapped in quantities of fine cloth, in cone shaped bundles, and making a great necropolis, described elsewhere, which is not to be confused with the tombs. It was located at a point removed from the tombs and lower down on the Cerro Colorado. The later date of the necropolis is proved by the fact that it was dug in the rubbish left by the people of the tombs. These data, collected on the ground, determine, I believe, that the pathological bones were pre-Columbian.

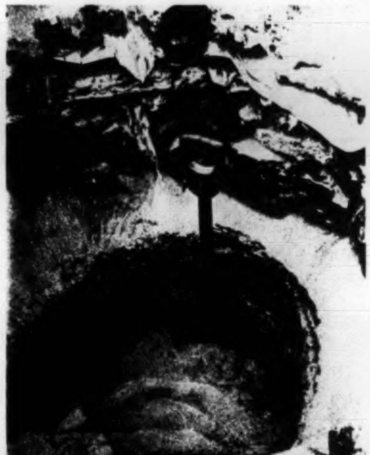
FIG. 4. VESTIBULE AND UPPER PART OF TUBE OF TOMB 4, NOV. 21, 1929. VESTIBULE RECONSTRUCTED.

The specimens are now in the Peruvian Museum of Archeology at Lima.

PATHOLOGY*

In November, 1929, Dr. Tello and I visited Paracas together. I can make no claim to being competent to pass on questions in archeology and still less to pronounce judgment on the rather complicated problems that the archeology of Peru presents. However, the main features of the topography and geology of the Paracas region, which Dr. Tello has so carefully described, are evident and easily understood. The landscape presents a picture of utter desolation. Only an occasional fisherman passes along the shore of the bay. The native caretaker refuses to live on the spot and occupies a shack with a family of fishermen about 2 km. nearer to Pisco. I have never been in Egypt but I should think that there are points of general resemblance between the tombs at Paracas and many of the royal tombs of Egypt, vastly finer though the latter may be: In both cases the tombs are in lonely places, some distance from any locality habitable by a large community, while the tombs have been excavated in the rock or ground, and have been used for the burial of the rich. The locations of the tombs are still plainly marked. Those that have been excavated are now filled with sand and completely buried. Tomb 4 proving the most accessible, a couple of laborers attacked that, and after two hours of digging, exposed the vestibule and neck, of which I secured a good photograph (Fig. 4).

Practically the whole of my endeavor has been to examine the diseased bones mentioned by Tello, using every means known to science in order to arrive at a correct diagnosis. In my opinion a diagnosis of syphilis may be made on the skull found by Tello at Paracas as far as it is humanly possible to make a diagnosis on a dry bone specimen, without clinical history or other data. The long bones found in the same grave also probably came from a case of syphilis, but it is not possible to make a diagnosis of syphilis in dry long bones with the same high degree of probability as can be done in the case of the skull.

The Syphilitic Skull: The appearance of the skull affected by syphilis has long been considered to be characteristic. Large museums of pathology usually have several or many specimens of such skulls, proving that pathologists in various countries have had the same conception of what constitutes a syphilitic skull. These museums usually have also a still larger number of skulls that are labelled syphilitic but that are not entirely characteristic. Fortunately for our argument, the skull from Paracas belongs to the most typical group. I have seen many modern specimens much like it in museums of pathology.

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* Dr. Williams.

Syphilis of bone in the adult person occurs late in the course of the disease. The characteristic changes in the skull are produced by a diffuse gummatous inflammation of the periosteum, frequently having localized gummatous nodules. The gummatous periostitis is accompanied by a certain amount of ostitis. It leads to destruction of bone, and simultaneously or later, there is a new formation of bone. An unevenness or irregularity of the surface of the skull results that is peculiar and very distinctive. English books sometimes speak of it as appearing worm-eaten.[2] (Tuberculosis may produce destruction without much new formation of bone.) Erosions bordered by new bone may be present, where there were gummata, partly healed.

According to Virchow[3] the scars remaining after a gummatous peripheral ostitis are most characteristic. There is deficiency of new formation in the middle and an excess at the outer part. Such scars produce jagged, not rarely stellate, depressions, with the most marked defect in the middle, and with smooth, rounded edges. A conservative statement and one from which no one can dissent may be quoted from Orth: "An irregular external hyperostosis of the skull occurs in connection with multiple irregular scar-like defects and then is to be regarded as in all probability syphilitic. Necroses of the skull cap may be produced by syphilis as well as by tuberculosis."[4]

The Paracas skull is very much like Orth's illustration, except that Orth's case showed a perforation in the frontal region and the Paracas specimen has perforations in the lower left parietal region.

The alterations produced by syphilis frequently affect a large part of the outer surface of the calvaria. The inner surface is almost never involved. The process often begins on the frontal bone but not always. The skull may be abnormally heavy, but is not necessarily so. Gummata may erode so deeply as to cause perforation of the skull, as happened in the specimen from Paracas. Large sequestra are sometimes formed.

The characteristic syphilitic skull used to be found at autopsies in our hospitals more commonly than it is now. The same is true of gummata of the viscera, which, all reports indicate, are much rarer than they were thirty or more years ago. That is probably the result of better diagnosis and treatment, though some observers believe that the virulence of the organism that causes syphilis has diminished.

A second and more diffuse form of periostitis, found in syphilis, that leads to new formation of bone, often quite dense and hard, with either a roughened or a smooth surface and with less destruction of bone, will be referred to in connection with the account of the long bones from Paracas.

The Paracas Skull (Figs. 5 and 6): The region involved by the disease process includes the frontal bone, both parietals, the occipital, and both mastoids. The involvement is most marked on the left side, behind and below, that is the lower, posterior angle of the left parietal and the adjacent mastoid.

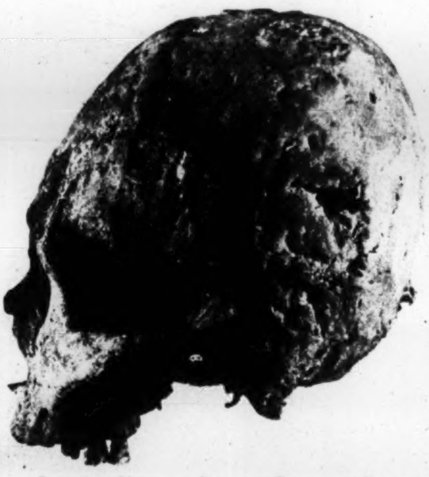

FIG. 5. LATERAL VIEW OF ANCIENT SKULL OF CASE 12-7509 FROM PARACAS, PERU. (*Courtesy Dr. H. L. Shapiro, Am. Mus. Nat. Hist., N. Y.*)

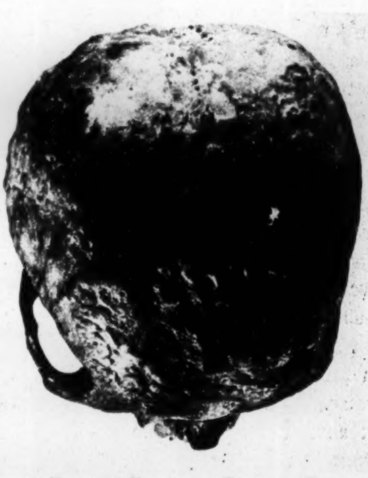

FIG. 6. FRONTAL REGION OF SKULL OF CASE 12-7509. (*Photo. Am. Mus. Nat. Hist., N. Y.*)

Frontal bone: nearly the whole bone, from the eyebrow ridges back, is affected. The surface presents low elevations, varying in size, but about 1 cm. in diameter, between which are depressions, which, especially on the right side, are frequently linear, sometimes stellate.

Right parietal bone: the bone is affected in the same way as the frontal, but less notably. Just below the parietal eminence are two minute openings into the interior of the skull; each is situated at the base of a small depressed scar; they were probably produced by disease. Another small opening a little further back was probably made post mortem.

Right mastoid: the disease appears to have extended on to this process from the neighboring parietal and occipital; the changes are not very marked.

Occipital: the anterior half of the bone is affected; the irregularity of the surface is not very great. About the middle of the area of involvement occurs a depression, 1.25 cm. long x 2 cm. broad, approximately rectangular in form. It is due to erosion of the external table, probably produced by active ulceration, but possibly formed post mortem.

Left parietal: the surface of the anterior half is only slightly irregular; the posterior half exhibits very severe involvement. Just behind the parietal eminence is an area of ivory-like irregular thickening about 4 cm. long × 3 cm. broad. In the lower posterior half of the parietal occur 4 openings into the interior of the skull. Three of these openings are minute, being 1 to 4 mm. in diameter. All occur at the bottoms of depressed scars. None of them could be due to post-mortem erosion. The fourth and lowest opening is larger. Its form is very irregular, something like an axe with a short handle. Its greatest length is about 28 mm.; its greatest breadth about 10 mm. Its edges are thin but rounded. There is no evidence of injury or fracture. It bears no resemblance to the results produced by trepanation, as could be determined by comparison with many admirable examples of trepanation done by the ancient Peruvians in the large collections under Tello's direction. It is evidently the result of ulceration that has healed. Below this opening are five small areas of active ulceration, two on the parietal, two on the mastoid, and one at the junction of the parietal and mastoid. Over the lower and posterior part of the parietal are several examples (about nine) of irregular, short, linear scars, some of them stellate, corresponding closely to the form of lesion described by Virchow as pathognomonic for syphilis.

The inner surface of the skull is smooth. There is no indication of fracture. The skull in general presents a dark yellowish-brown patina, like old ivory. Probably for that reason it was difficult to make a satisfactory photograph.[5] It is rather heavy. The sutures are nearly obliterated. It is moderately flattened anteroposteriorly. The lower jaw is missing. In the upper jaw the second right molar, the third left molar and the stump of the first left molar are the only teeth present. The second bicuspid and first molar on the right were lost during life as was shown by atrophy of the alveolar process. The skull was evidently that of an elderly person.

Syphilis of Long Bones: Syphilis often produces changes in the long bones as one of its late manifestations. The tibia and clavicle are mentioned among those frequently affected, but other bones are not rarely involved. As in the case of the skull, the disease may appear as a gummatous periostitis and ostitis producing irregular depressions, erosion and thickening. A more diffuse form of periostitis that leads to thickening of the bones with either a smooth or a roughened surface over a considerable area also occurs. The medullary canal may be narrowed. The bone may be noticeably heavy, as the new formation may be hard and dense. Both forms may be present in one and the same bone.

With the unaided eye it is impossible to distinguish the results of syphilis from those produced by chronic periostitis with osteomyelitis, or from that condition, (not properly an inflammation at all) loaded down with a confusing number of names: ostitis fibrosa, ostitis deformans, Paget's disease, osteodystrophia fibrosa. The diagnosis of syphilis of the long bones by means of *x*-rays has been developed especially by Ludwig Pick and his pupils. They conclude that the diagnosis of syphilis from ostitis deformans (Paget's disease) can usually be made, but that the diagnosis of syphilis from chronic periostitis is not usually possible, as in both of them new layers of bone are formed below the periosteum.[6]

As to the diagnosis of syphilis in dried bones in thin sections examined by means of the microscope, without going into a quantity of technical detail, it may be said that about the same result can be achieved as is claimed for the *x*-ray. By its histological structure, it is usually possible to distinguish syphilis from ostitis deformans (Paget's disease) but not from chronic periostitis.

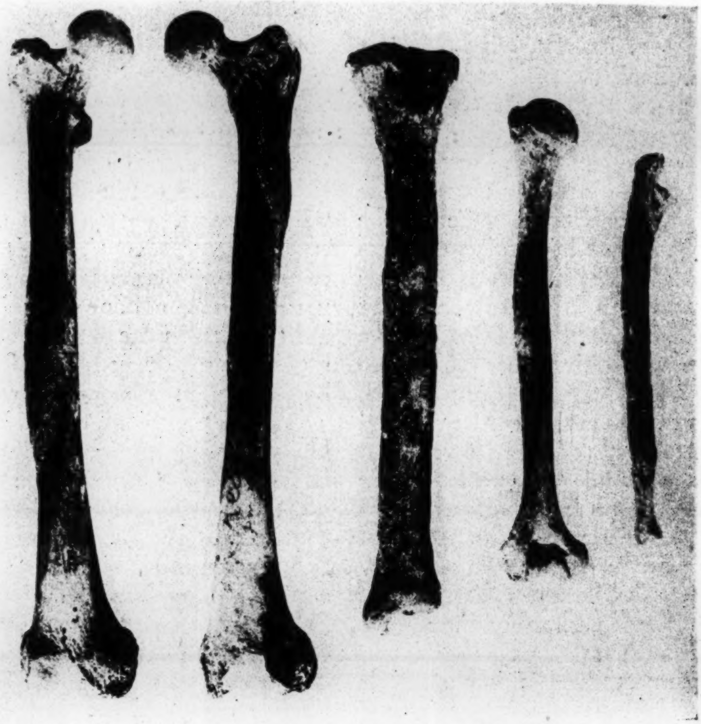

FIG. 7. LONG BONES OF CASE 12-7509. (*Photo. Am. Mus. Nat. Hist., N. Y.*)

The simultaneous involvement of the skull and so many of the long bones as seems to have occurred in the Paracas specimens is perhaps unusual, but certainly not very improbable. The Museum of the Rudolf Virchow Hospital (Charité) in Berlin and the Musée Dupuytren in Paris have admirable complete skeletons from cases of syphilis with marked involvement of the skull and of some of the long bones.

The Long Bones from Paracas (Fig. 7): The long bones in question are two femurs, and the left tibia, humerus and ulna.

The right femur is 40 cm. long. It shows well marked thickening along about its middle third on the anterior and outer aspect. The area of thickening is smooth, and evidently a new growth from the periosteum. The left femur is 39.5 cm. long. It is thickened over a part of its anterior and outer aspect, beginning below the great trochanter, and extending over about the upper one-fourth. There is thickening also in front, extending to a point below the middle. The area of thickening is mostly smooth, though it shows some small openings and short vertical grooves. The growth is evidently periosteal.

The angles made by the necks of the femurs with the shafts indicate that they came from an elderly person.

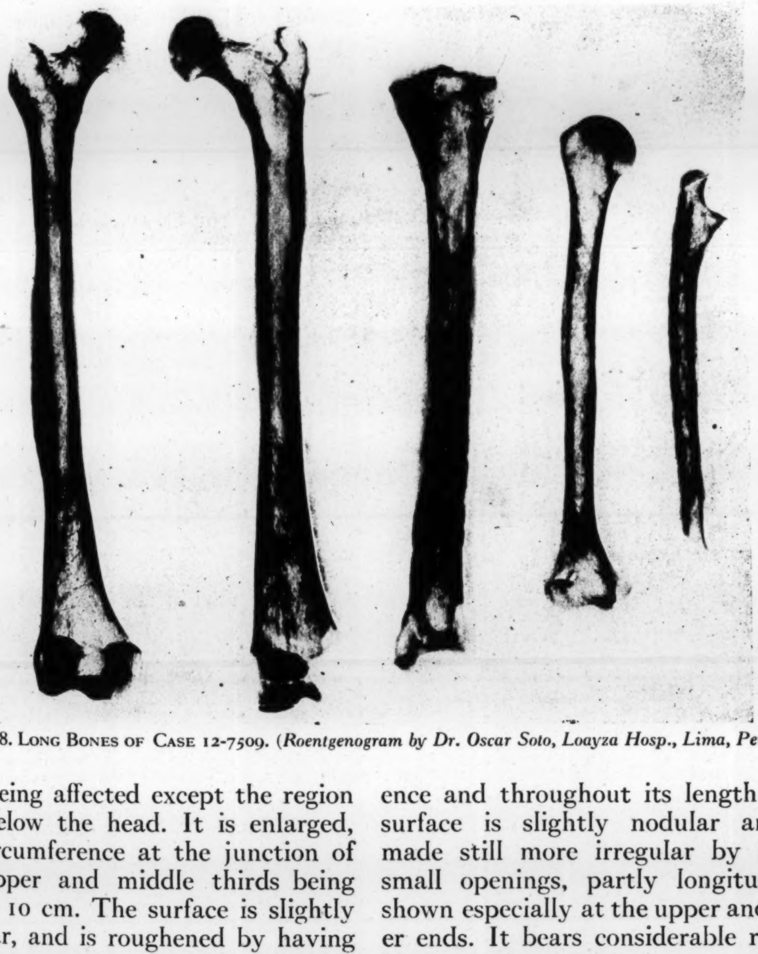

FIG. 8. LONG BONES OF CASE 12-7509. (*Roentgenogram by Dr. Oscar Soto, Loayza Hosp., Lima, Peru.*)

The left tibia is 33.5 cm. long. It presents the most marked involvement of any of the bones, almost all of it being affected except the region just below the head. It is enlarged, the circumference at the junction of the upper and middle thirds being nearly 10 cm. The surface is slightly nodular, and is roughened by having many punctate openings, and short vertical grooves.

The left humerus is 27.5 cm. long. It is thickened moderately in its upper half, especially in the second quarter from above, where there are many small openings, partly longitudinal. It is not noticeably heavy.

The left ulna is heavy, in spite of the fact that a small portion of the lower end is broken off. The portion remaining is 21 cm. in length. It is thickened throughout its circumference and throughout its length. The surface is slightly nodular and is made still more irregular by many small openings, partly longitudinal, shown especially at the upper and lower ends. It bears considerable resemblance to bones seen in acute periostitis and osteomyelitis.

The absence of sinuses or sequestra in any of these long bones may be noted as being in favor of the diagnosis of syphilis and against that of periostitis and osteomyelitis.

Examination by X-Rays: An admirable roentgenogram of the long bones was kindly made for us by the courtesy of Dr. Oscar Soto of the Loayza Hospital, Lima (Fig. 8). The new growth of periosteal bone is plainly shown in all of the bones. There is also some encroachment upon the medullary canal. The delicacy with which the normal framework of the bones appears in the roentgenogram, especially at the ends of the femurs, is probably due to removal of some of the calcium salts by natural agencies post mortem. In having small pieces of the bones decalcified to make sections for study with the microscope, referred to in a subsequent paragraph, it was remarked that decalcification with 5 per cent nitric acid was unusually easy and rapid. The *x*-ray picture is consistent with syphilis; it could have been produced by chronic periostitis and osteomyelitis; it does not resemble that seen in ostitis deformans (Paget's disease).

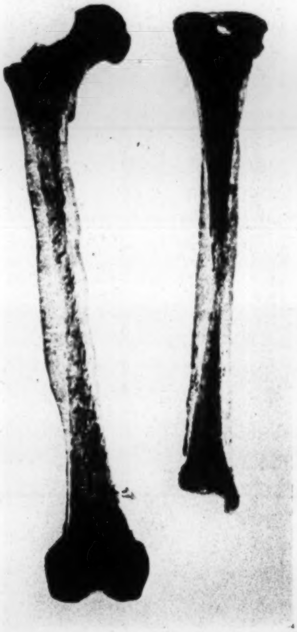

Fig. 9. Right Femur and Left Tibia of Case 12-7509 after Being Sawed.

Examination in Sections (Fig. 9): The right femur and left tibia were sawed through vertically. The new growth of periosteal bone upon the surface is plainly shown. The narrowing of the medullary part of the bone is especially marked in the tibia. The evidence given by the *x*-ray is confirmed and amplified therefore.

Histology of the Long Bones (Figs. 10 and 11): Pieces of the right femur and left tibia were removed from the most thickened parts of these bones after they had been sawed through. In 5 per cent nitric acid they were easily and rapidly decalcified. Sections were made after formaldehyde fixation and celloidin embedding. These were stained with hematoxylin and eosin; the hematoxylin was practically without effect. The outer surface stained more deeply with eosin than the inner parts. The cavities occupied by the bone cells were visible but not distinct. Foreign material was plentiful, especially in or near the outer surfaces. It consisted of dark particles, evidently soil, thread-like masses and small round bodies that were derived from some unindentified fungus, and large, generally rounded yellow masses that could not be identified at all.

The sections show that both bones consist of layers of lamellae, that are deposited very irregularly near the outer surfaces. Both show numerous cavities of good size, running in general parallel with the long axes and with the outer surfaces. The line between the new-formed periosteal bone and the underlying bone is well-marked in the section from the femur; in the section from the tibia the line is indistinct. In general, the structure

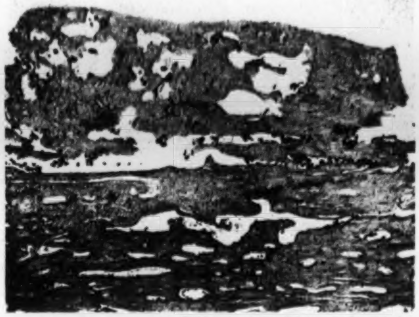

FIG. 10. SECTION OF FEMUR (× ABOUT 6 to 7).

seems to me to agree with the descriptions given for syphilitic long bones by Weber and by Nestmann[7] in their recent articles. The large size of the spaces appears to me to indicate the presence of ostitis as well as of periostitis; that view is in agreement with the encroachment on the medullary part of the bone shown in the roentgenograms and in the longitudinal sections. Haversian systems, but poorly developed, appear in both sections in small numbers, near the outer surfaces. The extreme outer surface of the tibia shows on one side irregularities in structure that somewhat resemble the disturbance of the normal arrangement called mosaic structures described by Schmorl[8] as being characteristic of ostitis fibrosa, (ostitis deformans, etc.). However, Nestmann found mosaic structures in one of his cases of bone syphilis. Ostitis deformans is a rare disease in the United States, and I have sections from only two cases available for comparison, and in both the process is still active. The architecture of these sections does not resemble that shown in the femur and tibia from Paracas. In my opinion the sections from the Paracas bones indicate the presence of an osteoperiostitis that was probably caused by syphilis but that might have been produced by some other cause.

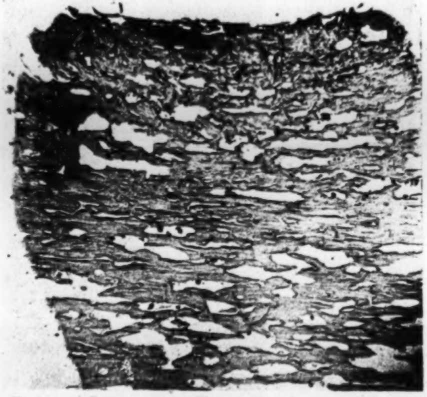

FIG. 11. SECTION OF TIBIA (× ABOUT 6 to 7).

Summary and Discussion: The bones that are the subject of this paper are referred by their discoverer (Tello) to the early Paracas period. As that was followed by a later Paracas period, and both of them preceded the Nasca period, which was in turn followed by the Inca period, it is evident in Tello's opinion that they belonged to a time that antedated the historic period by many centuries.

The rock tombs at Paracas contained many bodies, and frequently loose bones and skulls were found around the openings of the bottle-shaped tombs as well as within the tombs; such bones have been regarded by Tello as having been taken from the tombs to make room for new bodies. The skull and three long bones in this case were found outside of the tomb near the opening into it; two long bones were found in the vestibule. Objects characteristic of the early Paracas culture, including a small plate of gold, were found adjacent to these bones, exactly as has been observed in the case of other tombs. Although *huaqueros* and treasure-hunters had done some work in the vicinity, there was no evidence that they had been at these rock tombs. The ground about tomb v was undisturbed. The skull presented the yellowish-brown patina shown by very old bones; it had not been bleached by exposure to the elements. It had the peculiar cuneiform type of deformation characteristic of Paracas. Although the possibility that the bones under discussion may have been introduced into the ground above tomb v at a recent date must be conceded, it is believed that the facts stated indicate that they are ancient.

While it is not possible to say of any dried skull with absolute certainty that it is syphilitic, nevertheless the skull affected by syphilis has long been regarded as having very characteristic signs. The Paracas skull has the features of a typical syphilitic skull.

The diagnosis of syphilis in long bones cannot be made with the same degree of probability as can be done in the case of the skull. The long bones from Paracas have been studied by means of *x*-rays and in sections. It can be said that what they show is consistent with syphilis, and that they probably are syphilitic. It is not certain that the skull and long bones in this case came from one and the same individual, but they probably did so. One can state confidently that in any modern museum of pathology these bones would be regarded as syphilitic (Williams). On account of the importance of this case we have described the characteristics of the bones and the circumstances under which they were found in detail.

As it may be suggested that the changes in these bones may have been produced by some of the tropical diseases of Peru, that subject may be taken up briefly. It is very doubtful that verruga affects bones; if it does so that must occur very rarely, and the changes seem not to have been thoroughly studied.[9] Two forms of leishmaniasis are quite common in Peru: uta and espundia. They rarely involve the bones, although there is sometimes erosion of the face. Such an involvement of the skull as occurred in the Paracas case is regarded as incredible by Peruvian physicians who have had large experience with leishmaniasis.

That tropical disease of many names framboesia (yaws, pian, bubas) is said to be practically unknown today in Peru on the western side of the Andes, though cases occur in the tropical forest regions east of the Andes. Little has been written on changes in the bone in framboesia, although the bones may rarely be affected late in the disease. As far as we can learn, nothing like the extent of involvement shown in the Paracas case has ever been seen in framboesia. Some also regard framboesia as a variety of syphilis.

A large amount of material from Paracas remains to be examined, and it is possible, if not probable, that other cases of syphilis from this locality may be found. In the Peruvian Museum of Archeology there are now more than 300 bodies, mostly mummies from Paracas, waiting to be studied. Already (November, 1929) a mummy (No. 262) that was unwrapped in the presence of both of us has been found to have a large ulcer in the roof of the mouth that eroded the hard palate. We can assert unhesitatingly that the first thought of a physician of the present day, on seeing such an ulcer, would be syphilis, which he would proceed to prove by means of a Wassermann test and by searching for the Spirocheta pallida. (Dr. Pedro Weiss of the Loayza Hospital kindly examined films and sections of this ulcer with negative results.) The unwrapping of these mummies with preservation of the beautiful textiles with which they are surrounded is a slow process. The possibility that another case of syphilis may be found will constantly be kept in mind.

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JOHN KEATS

THE REACTIONS OF A GENIUS TO TUBERCULOSIS AND OTHER ADVERSITIES

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STRANGE indeed would be the spectacle of a primrose flowering in a London gutter, nourished by the slime and cherished by chill winds and fogs. No less strange and exotic was the birth of England's great romantic poet above a livery stable at Finsbury Pavement, Moorfields, London.

Born prematurely to the head hostler and the daughter of the proprietor of the establishment, John Keats, lovingly and romantically called Adonais by a brother poet, first saw the world which was to unfold so beautifully for him and in turn use him so cruelly, on October 31, 1795.

There is little record of the few known ancestors of this man. They were plain middle-class people. Not one of them was in any way distinguished, especially in the arts or letters. It was as if two common sparrows nesting in the eaves of a haymow hatched forth a nightingale as their first born.

Brief as a falling star, coming unheralded and unpredicted, without orbit or position, he flashed, burned, expired; leaving the world more beautiful, and in turn more desolate because of his brilliant but tragic career.

Beauty enthralled him; he served her all through his short life. He died in his twenty-sixth year. Perhaps there never has been a youth, save Chatterton, who so early and so deeply stirred the literary world. His creed in matters of life and poesy may be summed up in his own beautiful couplet,

Beauty is truth and truth beauty, that is all
Ye know on earth and all ye need to know.

His life was by no means an idyllic existence. He toiled at his poetry, but it flowed with an intense indefinable and original grace from his brain. Early bad health bereft him of the very joy of living and the indifference of the public and the criticisms of the reviewers made him unhappy.

The father of the poet was an amiable, capable, clear-headed, resolute man. He was respected by his acquaintances and friends, and became in turn, after the retirement of his father-in-law, the proprietor of the Swan and Hoop livery stable. Little more is known of him, save that he was born in Cornwall. His death was untimely and tragic; falling from his horse in the streets of London he suffered a fractured skull from which he died. From his mother, Frances Jennings Keats, the poet inherited his intensely passionate nature and no doubt his imaginative qualities. She was by no means a cultivated person. She died when Keats was but ten years of age. The widow took unto herself another husband, one Rawlings, who deserted her shortly after the marriage. Unfortunately the mother of four young children did not leave after her an unbesmirched reputation. She died of tuberculosis and is said to have been in her last years a wanton woman. Keats rarely mentioned her in his many letters. One little incident reveals the strongly passionate and romantic nature of the poet in his childhood. It is related that one day, finding his mother ill and desiring seclusion, he stationed himself outside her bedroom door with a drawn sword in his hands and threatened harm to any who would disturb his parent. He was then but five years old.

From his father the poet must have inherited his good sense and virility. Sidney Colvin writes:

> When we consider the deep duality of Keats' nature, the trenchant contrast between the two selves that were in him, to trace to the mother . . . the feverishly over sensitive and morbidly passionate one, and to his father . . . the self that was all a manly good sense and good feeling and undisturbed clear vision and judgment. In the sequel we shall see this fine virile self in Keats continually battling against the other, always keeping in control . . .

From the meager facts obtained from the many biographies concerning the ancestry and traits of the members of the family, there is no hint of insanity in it, nor were they peculiar or neurotic. The poet himself was never truly queer or eccentric. His genius was not of the pathologic tree: he was neurasthenic because of somatic disease and disappointments. The childhood of the poet was uneventful. He was reared by a guardian named Abbey, a bumptious tea merchant, who gave his charges much trouble. All of the children were well educated. John received a good classical schooling at the hands of an inspiring and good teacher named Clark. The youth often spoiled for a fight and most often came off victorious in these early combats. He was no weakling or coward in spite of his diminutive height; at maturity he was but five feet tall, but he was strongly and sturdily built, and was vigorous and athletic in his habits. Barry Cornwall, a brother poet who knew Keats very well, thus described his personal appearances. "It has been said that his poetry was affected and effeminate. I can only say I never encountered a more manly, simple young man. In person he was short and had large and wonderfully luminous eyes—a resolute bearing, not defiant but well sustained."

Largely because Mrs. Abbey, his guardian's wife, had noted that young Johnny Keats had attended to his sick mother dutifully and tenderly, she strongly urged that he should study medicine. While he felt no urge to follow this profession, he was forthwith apprenticed to steady going, sober Thomas Hammond, surgeon-apothecary. For several years the young man ground drugs, spread plasters, assisted at tooth drawings, bleedings, etc., and cared for his master's horse, picking up here and there useful bits of medical lore as he aided the hard working practitioner in a London suburb. After serving part of his time he was released and entered the combined medical schools of Guy's and St. Thomas Hospitals. Shortly he became dresser to a surgeon named Lucas, who is described as a slow, clumsy, uninspiring surgeon, partly deaf but good natured and popular with the students. Sir Astley Cooper was a member of the faculty at this time. He was then a brilliant teacher and a splendid surgeon. What might have happened to young Keats if he had been assigned as dresser to this famous man one can only conjecture.

He was licensed as apothecary and surgeon after spending about eighteen months in study. Keats did not in any way distinguish himself while in the medical school, but passed his examinations satisfactorily. He related one incident which shows how very far his thoughts and intents were from interest in medicine. One dull cloudy day the sun came out and a ray of light shed its loveliness across the dreary benches and lecturer's stand. "Instantly," he said, "I began to see Oberon and his fairy band in the beam, and I was far away from the subject which the lecturer was explaining."

Keats promptly forgot all the morbid but useful things that he learned. There is not the slightest hint in any of his writings, especially his verse, that he ever knew anything about medicine, anatomy or pathology. When he left the school he never practiced save that once soon after he opened the temporal artery of a man with neatness and expediency, and while on a disastrous voyage to Italy he directed the treatment of a young lady who had swooned. He was not a doctor. The profession cannot very well claim him, except that he went through the curriculum of a good medical school, but with no particular distinction.

It was while he was attending lectures under the unimaginative Lucas (1816) that he wrote what has been called the perfect sonnet. It is looked upon as a model in form and beauty by every lover of English literature. One can see how the die was cast, for in the composition of the famous Sonnet beginning, "Much have I travelled in the realms of gold," the medical student, having glimpsed Parnassus, could not henceforth be interested in hobnailed livers and other morbid things. He meant to be a poet and a great one he became. Spenser was his model and example. This Elizabethan, arrayed against Lucas and his ilk, won, as did Scylla and Glaucus over varicose veins and rodent ulcers.

From his grandfather Jennings he inherited some £1500. The income from this allowed him to live without engaging in any profession or trade other than the pursuit of literature, and at it he made so little money that there is scant record of it in the biographies.

He knew his qualifications and powers better than any one, especially the blundering matter-of-fact Abbey, his guardian. The latter thought that a poet was something of an immoral person. He would not allow John's only sister to see him, and in other ways hindered the young genius.

Equipped with a splendid imagination, poetic temperament and wonderful facility for rhythms and meters, he soon revealed the strength of his genius, declared by numerous critics to be inferior only to Shakespeare. Sidney Colvin, a most understanding and sympathetic biographer says of him and his poetry at this time, quoting Matthew Arnold in part, " . . . insisting on veins of flint and iron in his nature . . . on his clear sightedness, his lucidity of perception, of the vital connection of beauty and truth, and of both with joy, declaring that no one else has in expression quite the fascinating felicity of Keats, his perfection of loveliness." Keats himself remarked to one of his friends "I think that I shall be among the English poets after my death." To this Arnold responds, "He is—he is with Shakespeare."

Thus at the age at which most college boys, having finished their academic course, begin to study a profession, this youth of twenty-two set himself up as poet and philosopher. His mind and methods and manners of thought at this period were most mature. It is not within the scope of this paper to discuss in detail the merits and other features of his marvelous verse. It is too well known for any description at my hands save that it is important to note that Keats was of the highest type of a romantic poet. He had in him a certain Grecian sensuousness. Spenser and Chaucer, particularly the former, inspired him more than any other of the great ones that had preceded him in England, cockneys both if you please. The quality of his verse fluctuated very much according to his health, and conditions of rest and fatigue.

While his inheritance served to keep him comfortably during the first years of his literary career, money difficulties early began to play a disturbing rôle in his affairs. Generous of heart he loaned money over and over to a half-genius named Haydon, who lived by borrowing, just as Leigh Hunt did. Haydon never made any attempt to repay his liberal friend; this later was another worrying factor. The horror of penury hung over him constantly for several years. These monetary factors, his unhappy love affair which could not culminate in marriage, his ill health and the malicious criticisms directed against him all contrived to make this pathetic figure one of the most unhappy in the history of literature.

His engaging personality, ready, warm-hearted willingness to aid his friends, his evident genius, soon made for him valuable friendships among the London literary and artistic men of his time. They grew to be staunch and devoted supporters, intensely interested in his work, and were a great comfort to him when his life grew hard and bitter. It is most important to note that the three brothers were more than uncommonly attached and loyal to one another, probably because they were orphans. The death of the youngest brother wreaked havoc with John, darkening his life and thoughts very much. Tom died when John was but twenty-three years old, almost in the poet's arms. This experience was more than harrowing; it devastated the sensitive and affectionate youth. For three months he but rarely left Tom's side. In a letter to one of his friends, Reynolds, he wrote "at such times the relief, the feverish relief of poetry seems a much less crime. This morning poetry has conquered. I have escaped into those abstractions which are my life. I feel escaped from a new threatening sorrow. I am thankful for it. There is an awful warmth about my heart like a load of immortality." It was during this period that Keats wrote Hyperion, which he never was able to finish. It contains some of his finest conceptions.

"What he called abstractions," according to Sydney Colvin, "into which he had plunged, were conceptions of fallen Titans. These conceptions . . . in the verses which every English reader knows, verses of cadence as majestic almost as any in the language . . . charged with high emotion pregnant with the sense and pressure of destiny." What sublime figures this mere youth was creating in the intervals of dreary heart-breaking nursing!

Amy Lowell in an admirable bit of criticism says of Keats and his work, "What Keats tried to do in Hyperion, Milton did better. What he tried to do in the odes, La Belle Dame Sans Merci, in the Eve of St. Agnes, diverse as these poems are to each other, no one has ever approached." From lyrics, sonnets and odes he had advanced in heroic strides. Only Milton exceeded him in the estimation of this very good critic. Keats himself says of his own mental state at this time, "No sooner am I alone, than shapes of epic greatness are stationed round and serve my spirit, the office which is equivalent to a king's bodyguard. 'Then tragedy with sceptered pall comes sweeping by.' What the imagination seizes as beauty must be truth."

After most painful sufferings poor Tom died. His nervousness was a very trying feature. The brother in spite of the escapes into realms of romance was left desolated and surcharged with grief. He who could feel beauty and joy so keenly in turn had to endure more than most men the poignancy of this grief.

The brothers at this time were living in a small cottage on Hampstead Heath. After Tom's burial John moved to Wentworth Place, a villa near by. He shared with Mr. Dilks, one of his friends, this pleasant abode. While there Dilks one day shot a white rabbit in the grounds. This episode upset the poet very greatly. He declared the little beast to be the spirit of Tom. "No reasoning or argument," says Lowell, "had the slightest effect. He held to his belief so earnestly and with so much emotion that when the rabbit appeared upon the table cooked and dished no one felt any inclination to eat it and it was sent away untouched."

The reaction of the nervously exhausted grief-stricken and most imaginative man was very great. No doubt he experienced what James has called an organic resonance, affecting him severely. Not only was the poet over-stressed and over-fatigued by his vigils and his sorrow, but it must be mentioned that tuberculosis in the young man was beginning to make inroads. Just previous to Tom's death John had parted with his other brother George, who went to America with his wife in hopes of recouping his fortunes. John had no hopes of seeing this brother again. America then was considered to be a wilderness and a dangerous place in which to live. After bidding George good-bye at Liverpool, Keats and Brown started on a long walking tour up to Scotland. Their plan was to walk through that country and back to London. The tour was most arduous; in all they walked 640 miles, very often doing 30 miles a day without intervals of rest. Mountains were climbed, often after a long journey to their bases. The weather was bad, frequently it was cold and foggy, the food was at times very poor. The plan of travelling that these youths adopted was to start on the day's walk before dawn and after walking some eight or ten miles, to break their fasts where they could. This speaks for the inherent strength of the young poet, but the exertions at the finish exhausted him. Keats was compelled to leave his companion and travel to London by boat from Edinburgh. It was during this walking trip that he developed a sore throat; this never left him. It was the beginning of tuberculous laryngitis. Just before he started in 1817, Keats had finished his most ambitious poem, Endymion, in the year in which he became a licentiate at Guy's Hospital. The writing of this great poem was a most exhausting task. It contains over four thousand lines. These are rhymed, adding very much to the difficulty of the composition. So fatigued was he and so psychasthenic after this performance that he found it necessary to go to a retreat in the country for a time.

While on the Scottish trip Keats wrote some poems, one written on the summit of Ben Nevis. It is a sonnet and not one of his best. Colvin says "It was above his worst, much below his best."

After a long excursion to the birthplace of Burns, he wrote another on his arrival about the place and its associations. While it is highly intellectual and very good it by no means ranks with his other remarkable sonnets.

Soon after the appearance of Endymion, a truly lovely poem, original in conception, Grecian in sentiment, full of imagery and music, some reviews of it appeared in two Edinburgh magazines, *Blackwood's Edinburgh Magazine* and the *Quarterly*. The editors of the former, John Wilson and Lockhart here began their attacks upon the so-called Cockney School of poetry and on Keats in particular. This was largely because the poet and his friends belonged to an opposite political party to the magazine owners. These men were young Oxford graduates. Wilson was a huge athletic man full of vigor. Later in life he became a professor of Moral Philosophy and wrote under the name of Christopher North. Lockhart subsequently won fame as the biographer of Sir Walter Scott, having married his daughter. It must be recorded that Lockhart years afterward repented of his actions, as did Wilson.

The first of these reviews, according to Amy Lowell, was wanton cruelty.

> We venture to make one small prophecy, that the book seller will not venture £50 upon anything he can write. It is a better thing to be a starved apothecary than a starved poet, so back to your shop, Mr. Keats, to plasters, pills, ointment and boxes. But for heaven's sake, young Sangrado, be a little more sparing of extenuatives and soporifics in your practice than you have been in your poetry.

This was by the meaner and more despicable of the two men, Lockhart.

Wilson next wields his vitriolic pen with "his Endymion is not a Greek shepherd loved by a Greek goddess. He is merely a Cockney rhymster dreaming a phantastic dream at the full of the moon." The reviews were written by these two dastards under the nom de plume "Z." These exhibitions, according to Lowell, showed a yellow streak. "Nowhere were there such felon strokes dealt with such wantonness of heart as Blackwood's," says Colvin. Another bit of malice from "Z" reads "Hunt is a small poet but a clever man, Mr. Keats is still a smaller poet and he is only a boy of petty abilities, which he has done everything in his power to spoil." Once or twice, he who has been ranked with Shakespeare by a true poet, Matthew Arnold, was called "Johnny Keats." George Keats' reaction to this fresh belittling slap at his brother was a short and blasphemous retort which cannot be quoted.

After Keats' death Shelley, as will be later brought out, wrote a beautiful elegiac poem, "Adonais" a dealing with the sad and untimely death of Keats and the contumely heaped upon him. This was followed by a review by the cads in Edinburgh, one sentence of which reads "It did not alarm us half so seriously as the calm, settled, imperturbable drivelling idiocy of Endymion."

There is no record of any such dastardly, unkind and venomous criticism in all the history of English literature. So rancorous and bitter was the feeling toward Lockhart, on the part of the friends and admirers of Keats, that after years of smouldering enmity and spleen, a duel resulted. An editor by the name of John Scott, who was a partisan of Keats' friends and an admirer of his poetry, excited the wrath of a friend of Lockhart named Christie. In the meeting that resulted from the challenge, poor Scott, who has been described as an amiable, friendly man, was slain. This happened after the death of Keats, but the persistence of the rancor and hate for many years indicates the pitch to which the feeling rose.

These factors, and grief, disappointment in the lack of appreciation of his greatest poem, the walking trip, followed by Tom's death, and the beginning of the fatal malady, all wrought havoc with his over-stressed and tired out nerves. The incident of the white rabbit was either a pure delusion or a poet's phantasy; I am inclined to the latter view. It was a straw, however, showing which way the winds of mental disturbance were to blow.

Keats was now in what James calls a melting mood. Such mental states are caused by grief, escape from sudden or violent death, or other great emotion. No doubt this state of mind preceded the mental reaction to the killing of the rabbit. Most people harden themselves soon after such meltings. Keats' good friends sought to harden him, so he was taken to witness a prize fight. Perhaps he forgot his great sorrow at the ringside, but he who could feel deeply the tribulations of the fallen Titans in Hyperion, could hardly be expected to recover his mental equilibrium by seeing two brutes pummel each other for thirty-four rounds. Sorrow and worry began to assail and undermine this fine, unhappy spirit. One rarely reads of any happiness in the short life of this man. When deep in his "abstractions," as he called his escapes into the fairyland of romance, he must have known the purest joy. He was so full of his poetry that his characters were very real to him. He partook of their pleasures and suffered some of their pains. I am very certain that he experienced while at work an euphoria unknown to "the base mechanicals."

He never forgot Tom and the dreadful bedside scenes in which he took such a sorry and laborious part. Two years afterwards he was to undergo even more distress than Tom had known on his deathbed; the acuteness of his imagination and all that it summoned up, added much to the poignancy of his own sufferings. It is more than likely that the tuberculous poisons intoxicated and enriched the imaginations of Stevenson and Chopin and other geniuses. These poisons no doubt added much to the fervid vision of this man. I am sure that they guilded his genius. A peculiar mental hyperesthesia characterizes this disease in even the most commonplace minds. There can be no doubt that Keats was hyperesthetic, acutely so. He, by this time, had a little fever, yet his disease was to run for years. Tuberculous laryngitis is always secondary to an infective focus in the lungs. This is accompanied generally by some fever. The reaction of the body to an infection, it is well known, increases the metabolic rate. DuBois says "that for every degree of fever, the rate increases 13. In tuberculous processes, according to this authority, "the rise in the metabolism is not so great as it is in other infections." Mental processes are influenced by metabolic changes, in turn thinking affects these reactions. James, in speaking of the effects of pathological body processes upon the mental functions, says:

> We speak disparagingly of feverish fancies; surely the fever process as such is not the ground for our disesteem. For aught we know to the contrary, 103 or 104 might be a much more favorable temperature for truths to germinate in than the ordinary blood heat of 97 or 98 degrees. We praise the thoughts which health brings. Health's peculiar chemical metabolisms have nothing to do with the determining of our judgment. We know, in fact, almost nothing about these metabolisms . . . All such mental overtensions, when you come to the bottom of the matter, are mere affairs of diathesis (autointoxications most probably) due to perverted action of various glands which physiology will yet discover.

A fit of languor came over him one morning. It was not mere laziness as Keats supposes, but I take it to be one of the first signs of mental relaxation which mark the early appearance of tuberculosis. The passage in a letter is over long for much quoting. Keats speaks of

> . . . a sort of temper, indolent and supremely careless . . . having slumbered until nearly eleven and weakened the animal fibre all over me to a delightful sensation, to three degrees this side of faintness . . . In this state of effeminacy the fibres of the brain are relaxed in common with the rest of the body, and to such a happy degree that pleasure has no show of enticement and pain no unbearable power.

Another factor appeared on the stage after the death of Tom and commenced to trouble the spirit of this lover of beauty, this dreamer of splendid visions, this sensitive, affectionate man. He fell in love with Fanny Brawn. Soon after it was apparent to his many friends that he was sick. The sore throat became worse, he developed many neurasthenic symptoms and yet his mind was most fertile. This year his bodily strength had not begun to be diminished, for it is related by his biographers that meeting with a giant hulk of a butcher boy who was teasing a kitten, Keats remonstrated with him so strenuously that a fist fight resulted. This combat lasted for nearly an hour. The poet finding a vulnerable spot in his adversary's defense, kept pounding him with blow after blow until the towering adversary had to be led away by his friends.

His mental output during the year 1819, which might well be called his *annus mirabilis*, was amazing. He had already written The Pot of Basil, Hyperion, Endymion and many sonnets, among them some of the very best. In this year his mind, overstressed by grief, by love, and fevered by the incipient tuberculosis, was stimulated to a pitch of excitement that must have been delightful yet in turn was painful. Original and glowing conceptions flowed from his fecund mind with astonishing ease, and his powers attained their highest peak. Now he "wills and moves with the men of the Parthenon frieze with health and gravity entirely carnal" says Louise Guiney. This mere youth produced in rapid succession, his great masterpieces, The Eve of St. Agnes, Bright Star, Would that I Were Constant as Thou Art, La Belle Dame Sans Merci, the Ode to the

Nightingale, To Melancholy, To a Grecian Urn, to Autumn, to Indolence; Lamia, an ambitious long poem begun in 1818, was completed (it is one of his best); ode to his sweetheart, Fanny, the sonnet, The Day is Gone, and the fragment Eve of St. Mark. These are the very high watermark of all English poetry. In these six months this genius produced far better poetry than all the poets of our great Republic have produced since it was founded.

Yet during his lifetime he had hardly any fame outside his circle of friends. His poems had very little sale. It was difficult for his publishers to sell five hundred copies. He was no more appreciated by his fellow countrymen in his lifetime than William Wordsworth is appreciated today by the habitués of Greenwich Village. Did ever a mind yield such rich fruit so luxuriantly and so rapidly? The London reviews praised him but these were generally done by his friends or their friends in turn. When Lamia appeared, *Blackwood's* again let go at him with another vulgar attack so horrid and so mean that it roused his many friends to anger that did not soon die away. This attack in 1820 was in the form of a lampoon. While it is vulgar, nevertheless it is witty and must be quoted to show to what low levels editors descended in order to help in the sale of their journals, and what the poet endured.

We from the hands of a cockney apothecary,
Brought off his pestle with which he was capering,
Swearing and swaggering, rhyming and vaporing,
Seized with a fit of poetic fury,
. . . Loud he exclaimed, here's my truncheon,
I'm the marshall of poets, I'll flatten your nuncheon.
Pitch physic to hell—you rascals, for damn ye-a
I'll physic you all with a clyster of Lamia.

Keats took the review attacks to all appearances rather calmly, but they rankled in his mind. On his deathbed in Rome he turned to Severn, who was his companion and nurse and charged, "If I die you must ruin Lockhart." On the other hand, of his reactions, Osler says, "the genius of Poetry must work out its own salvation in a man. The young man of twenty-three who could write calmly about the review attacks had the *mens sana* and could not be killed by a dozen reviews."

To return to Keats' love affair, which endured through various vicissitudes until his death; the family of the young girl, Fanny Brawn, treated the young lover with sense and kindness. Fanny herself displayed poise and calmness toward the vagaries and whims of her egocentric lover. Mrs. Brawn took the poet into her own home and nursed him for a time. When Keats found that he was tuberculous he offered to break his engagement but Fanny flatly declined to do so. To her he wrote several poems, an ode and a sonnet.

Sidney Colvin in commenting on the mental state of the poet at this period writes, "It was not often nor for long that the stings either of love or of poetry abated for him the least jot of their bitter sweet intensity, or the anticipation of poverty or the fever of incipient disease relaxed their grip." It was late in 1818 that the engagement took place and Keats' mind began to be disturbed by the madness that lovers experience. Madness is the lot of poets as well as lovers. Plato, quoted by Osler in his admirable short essay on "The Apothecary Poet," said:

> The third kind is the madness of those who are possessed by the muses, which, taking hold of a delicate and virgin soil with their inspiring frenzy, awakens lyrical and other numbers, with these adorning the myriad actions of ancient heroes for the instruction of posterity. But he who having no touch of the muses' madness in his soul comes to the door and thinks that he will get into the temple by the help of art—he, I say, and his poetry are not admitted. The sane man disappears and is nowhere, when he enters into rivalry with a mad man.

Osler quotes Oliver Wendell Holmes who wrote of his own mental state while writing "The Chambered Nautilus": "In writing the poem I was filled with the highest state of mental exaltation and the most crystalline clairvoyance that had ever been granted me—I mean the lucid vision of one's thought which will be at once precise and musical, which is the poet's special gift." Osler continues, "To the base mechanical of the working day world, this lucid vision, this crystalline clairvoyance and mental exaltation is indeed madness working in the brain, a state which he cannot understand, a Holy of Holies into which he cannot enter."

What may be called a fine melancholy came over Keats at times. Witness his feelings in his exquisite Ode to a Nightingale:

Darkling, I listen, for many a time,
I have been half in love with easeful death,
Called him soft names in many a mused rhyme
To take into the air my quiet breath.
Now more than ever seems it rich to die,
To cease upon the midnight with no pain.

One day after breakfast he went out into the garden on the heath and sitting under a plum tree in full blossom he heard a nightingale sing overhead. He found two bits of paper and wrote what is perhaps, nay, no doubt is, the very quintessence of loveliness in all English poetry. He carelessly folded up the papers and on entering the house thrust them behind some books, where they were discovered by Brown.

There was never any hope of the engagement with Fanny Brawn being consummated in marriage. This was because of financial reasons. Neither the young woman nor her family ever entertained the idea that Fanny's lover was a genius of the highest rank. Keats loved with all the passionate intensity which was his nature. Perhaps no one ever loves with the passion that a poet does. Keats saw his enamorata very often; for a time he lived in one half of the same house. She was good to him after her way. Little could the young woman comprehend of the deep poetic soul of her lover. It is hardly likely that she considered his splendid poems to her as more than pretty verses. She and the poet were congenial in some ways, but they quarrelled, chiefly because he was insanely jealous. She was attractive and quite handsome, more like "Charmian than Cleopatra," to quote the lover. The attractions that lured the poet were more physical than spiritual. Witness his passionate lines in his sonnet To Fanny:

That shape, that fairness, that sweet minor zest
  Of love, your kiss—those hands, those eyes divine,
That warm, white, lucent, million pleasured breast,
  Yourself—your soul—in pity give me all,
Withhold no atom's atom, or I die.

The engagement lasted until Keats' death. During the latter year or more, suspicion directed not only toward Fanny but toward his dearest friends, tormented him, tortured him, consumed him. If Fanny even went down into the city Keats was all but insane with jealousy. When he himself went into the heart of London to stay with Hunt, he would sit all day moodily glaring toward the heath where Fanny was, saying nothing. If he was very far from Fanny he was comfortable, if by her side he was perfectly content, but if he was a few miles away he experienced horror and forebodings, and was in constant ferment. Suspicion is the lot of the tuberculous; so is it with the man or woman with hyperthyroidism. Some times the thyroid in the presence of this infection takes on an over function. It is likely that it plays the chief rôle in the suspicions of the phthisical. Amy Lowell says in her fine life of Keats, "The agony of departure (from Fanny) completely obscured the joy of return. Every sort of nightmare took hold of him, until it reached a state verging on delirium."

He became hallucinatory; madness dominated this lofty soul. The hyperesthesia that overflowed so gloriously in his four great odes, creating the Titan Saturn, Madelaine, Porphyro, Dian and other rich and stately figures now danced insane images in his fevered brain.

While Sidney Colvin says of him that he exhibited "streaks of flint and of iron" yet he quailed before an hallucinatory image, or groundless fear, making him tremble, producing in his stricken mind what James has well called organic resonances. Of Brown and Dilke, his very good friends, companions and mentors, he was so jealous and suspicious that he exclaimed of them and Fanny, "they made a foot ball of my heart." "Hamlet's heart," he again cries out, "was full of such misery as mine is when he cried to Ophelia, 'Go to a nunnery—go! go!'" "These were but half delirious promptings of his fevered blood," said Lowell. A few weeks after this outburst he wrote to Brown as though counting him as much a friend as ever. (Colvin.)

"Of the many published love letters to Fanny," Osler says, "they wronged his memory. Whether of the young poet as Keats or an old philosopher as Swift, such maudlin cooings and despairing wails should be ruled out of court with the writings of paranoics."

The poet's mind, enfeebled by disease, distorted by jealousy and dread and other stresses, had not the power to quench suspicion, banish delusions, and trembled with the slightest emotion, and was exhausted after effort. He had not the power to complete his noble unfinished poem Hyperion, which has more of the epic in it than any other, and probably cost him more labor and consequent exhaustion than any of his other works. The Eve of St. Marks, too, lay incomplete. It is thought to have more promise than some other of his finished works. The flowering of his intellect was now over. No more Titans or lovely imagery and musical rhythms. There can be no doubt of the exquisite intellectual hyperesthesia of the poet during his wonderful period. The tuberculosis poisons and perhaps his over-active thyroid stimulated by the gonads reflected thereon, fed his intellectual fires.

William James in discussing the somatic influences of our various organs in health and disease upon the quality of our thoughts and behavior, half humorously says, that the way blood is perfused through an organ; the liver, for instance, determines whether its owner be either an atheist or a Methodist. Of course this is all speculative. We doctors see constantly evidences of the actions of a sick organ upon the kind of thought an individual produces. An ailing thyroid gland can give rise to delusions and hallucinations in susceptible people. Thinking processes are very often speeded up in hyperthyroidism. It is possible that the perfusion of tuberculous blood through Keats' thyroid had more to do with his heightened imaginative faculties than the functioning of any other of his organs. James thinks that the wonderful vision of St. Peter, in which he beheld all sorts and manners of beasts, contained in a cloth and let down by its four corners from heaven, was caused by an overloaded colon.

One must not be entirely beguiled by the theories of this beloved speculator. If we apply his idea but a little in the case of our poet, we might assume that Madeline rose chaste and lovely from a hectic cavity in the poet's lung; that all the luxuriance of the Eve of St. Agnes, all its marvellous imagery was so because some

Innumerable of stains and splendid dyes,
As are the tiger moth's deep damask wings

toxic matter escaped from his overcharged thyroid gland and tinctured his cerebral cortex. There may be some little truth in what he writes about a modicum of it. But the minds of all the tuberculous are not peopled with splendid figures because they have cavities in their lungs. It is not so much gray matter as it is gold matter and who has it, Matter perhaps in the case of Keats that played gorgeous fantasies upon his septum lucidum. Perhaps it is the purest kind of speculation to say that Keats had a better intellect than brain. It does not follow that when we speak of a fine brain that we mean a fine intellect. They are by no means synonomous terms. The brain performs many automatic functions which the intellect cannot do. It governs the heart beat and respiration, functions that are foreign to the intellect. Keats' powers rose to topmost flights of imagination and creative work. His perceptions were over sharp, yet he suffered from brain exhaustion even before active tuberculosis began to play a nefarious rôle. He had to rest up after writing Endymion for a long period. Equipped with robust brains (I am speaking of organs), many people can stand a great amount of buffeting and fatigue. These organs can go for a long time without sleep and can concentrate for long periods most intensely. Yet in creative powers they may be below the average. They can never soar mentally, their feet must always be on the ground.

When Keats' powers began to fade because of the inroads of disease, he must have experienced woeful disappointment and depression. The first apparent sign of tuberculosis to Keats was a hemorrhage from the lungs. In spite of this ominous symptom, only too potent for harm to the erstwhile medical man, his doctor assured him that there was not much the matter. The disease had for years been undermining his health, causing all of the early symptoms, exhaustion, malaise, depression, etc. It was an indication of advanced disease in Keats' case. It probably meant that a cavity had been present for some time in one lung. A hemorrhage may be a very early sign, but not here. Keats had been ill for many months. The prevalent idea among medical men and the laity at this period was that the bleeding was the first sign of phthisis and that it scattered the lesion. The doctor's views and those of the public at large were about the same in many diseases early in the 19th century. This accident happened late in the evening, after a cold ride up from the city to the heath. Keats staggered into his quarters so weak, so exhausted, so fevered, that Brown thought that he was intoxicated. On getting into a cold bed he was seized with a fit of coughing and spat blood. Witness his own dreadful foreboding at the sight of a bright red spot. He cried out to his friend that there was blood in his mouth and to bring a light. On seeing the bright spot on the sheet he exclaimed "that is arterial blood. This is my death warrant. I must die." Of course, he then only too vividly recalled the death of Tom and his mother from the disease that was slaying him. No doubt he recalled some horrid autopsies at Guy's or St. Thomas Hospital. Once he met Coleridge, who on shaking hands with the young poet, exclaimed to a friend aside. "There is death in that hand." Keats knew only too well what the future had for him.

A surgeon was summoned and, of course, he bled him, bled him until the poor chap fell asleep at five in the morning, from sheer exhaustion. A few years before this time an English surgeon serving the wounded on Waterloo's field, came upon a man bleeding to death from a wound in his thigh. The idiot proceeded to bleed the man from a vein. Keats was kept in bed more from his own weakness than from any orders that his doctor prescribed. After three days he was up and about again.

In the light of our twentieth century knowledge the treatment of this poor man, the accounts of the terrible mismanagement of his case are painful reading. Doctor after doctor was consulted. For a time Dr. Sawrey attended him. Then one more eminent in his profession, Robert Bree, a fellow of the Royal College of Physicians, took charge. The latter had some reputation because of his ability to cure asthma by the use of digitalis. He had written a book on the subject which had been issued in four editions. Because digitalis sometimes relieved asthma, he gave it to the poet and in nauseating doses. Amy Lowell comments upon this man Bree as follows: "However eminent Dr. Bree, he was certainly a poor diagnostician."

The invalid was put on very low rations, largely or entirely vegetable. He wrote to Fanny about this starvation diet. Complainingly he speaks "of the small quantity of food to which I am obliged to confine myself. I am sure a mouse would starve upon it." This of course greatly reduced him. He wrote to his sister that the reason for this was that the mists that clouded animals' brains would cloud his if he ate their flesh. In the days of the early 19th century the symptoms of a disease were treated and not the disease itself; hence the mental phenomena ascribed to these animal mists caused this interdiction against animal flesh as food. I am very much afraid that this was the opinion of one of Keats' doctors. Medical men entertained such theories then. In writing to Fanny Brawn, he says that if he "appears slack and indolent" it is because of the "nerve shaking medicine" which he was taking. This probably was antimony; it was given very often for phthisis in those days and used even during the lifetime of some of my readers. Several heart palpitations led Bree to order a short rest. Lowell in commenting upon the very poor advice that Keats received from his doctors and the general management of his case by them says: "Keats was an extraordinarily vigorous man, and there is little doubt that under the regime prescribed for patients today, he would have lived many years if not entirely recovered."

Slowly and painfully the disease progressed, with hectic fevers, spitting of blood, exhaustion, and the characteristic depression. Cap and Bells was written during this period, a story of the jealousies. "A melancholy performance," says one writer, "of what a great poet can produce when consumed by hopeless passion and disease."

Who peopled his fevered dreams, what majestic and crystalline figures, splendid as Hamlet or Lear, stalked in his stream of thought only to be dissolved in a dancing sea of irresolution and delirium? What gorgeous and yet harrowing nightmares he must have experienced! He was subject to weird and unhappy dreams at times even before he became very ill. No one prescribed rest, no one advised over feeding. He wandered around, a melancholy figure, a sorrow to his friends who sought to divert him when in one of his fits of savage despondency, in which he hated himself more than any other person.

And now the stage is set for the tragedy. The hateful furies crowd about him, jealousy, fear, suspicion, worry, penury, neglect, pain, and his mortal disease. Day by day they press closer like a Greek chorus chanting through clenched teeth his inevitable doom.

At length, at the approach of winter in 1820, he was advised to go to Italy. So he set sail on a bark, experiencing bad weather. After journeying for ten days the ship had not advanced but had been blown back beyond the port of departure. He was seasick and worn by the uncomfortable long voyage. At Gravesend he had procured a bottle of laudanum, in case his sufferings became so great that a speedy and painless death might be necessary. It was never used.

The Italian experiences were not only most uncomfortable for a sick man, but he suffered from homesickness, longing for Fanny and his friends. After a wearying five-day journey from Naples to Rome over rough roads, he finally was settled in lodgings. The following is all painful reading for anybody, particularly for a modern medical man.

Dr. James Clark, a Scotchman who had been highly recommended to Keats and to Severn, the painter, acted as companion and nurse to the sick man. This man was most kind and attentive. Amy Lowell says of him that he had a nice bedside manner, was most attentive and kind, but that he knew no medicine. After a long sojourn in Italy, Clark returned to England, was made court physician and a baronet. He made a fatal blundering diagnosis in the case of an estimable young woman, so far wrong that he ruined forever this lady's moral reputation for the rest of her days.

Clark came often to see his distinguished patient, but his lack of perceptive power, good sense and ability to make a proper diagnosis is evidenced by a passage from a letter that he wrote to a medical friend after seeing Keats for the first time. "The chief part of his disease seems to be in his stomach. I have some suspicion of disease of the heart, and it may be the lungs, but say nothing of this to his friends. I shall be able to give you something more satisfactory."

This amiable blunderer had not mother wit enough to see that the emaciated, fevered, coughing, staggering man was far advanced in phthisis. His treatment was as poor as his diagnosis. Keats was put upon a horse and he rode around Rome or else strolled slowly about. Of course he became rapidly worse, for he was all but dying when he landed at Naples. One feels almost like shouting back across the hundred years at the blundering doctors, "put the man to bed." Bed rest is 90 per cent of the cure of tuberculosis; climate and other measures have but relatively slight value. It was too late by a year to attempt to effect a cure; the poor chap was in the third stage of phthisis. But his end was not made less harrowing, as it might have been. It is true that dainty food was prepared by the kind doctor's wife, Lady Clark, and served by her at the wretched lodgings. Part of this dainty food was a daily ration of one piece of toast and one anchovy. This restriction was made because of the condition of Keats' stomach. The Italians at this period were far ahead of the rest of the world in the matter of hygiene in tuberculosis. After the death of any one with this disease, every bit of clothing, all the furniture were burned, the wall paper was scraped off and also destroyed by the police. The knowledge of this regulation by the invalid and Severn, distressed them both greatly, because of the likely destruction of some hired furniture and Severn's paintings. The sale of the latter would help the unselfish artist, pay his expenses. This man deserves great praise for his noble sacrifice in so devoting all of his time and strength to his suffering friend.

Lowell is highly incensed that neither the doctor nor Severn allowed Keats to drain the laudanum bottle and so painlessly end his sufferings; at Clark she rages in that he did not administer small doses of the opium to the suffering man. One gleam of wisdom the doctor did show in saying that Keats never should have been sent from home to Italy. Of course when the poor, famished, fevered man had a hemorrhage Clark bled him. If the amount of blood lost was four ounces, four ounces, were let from a vein. It is hard to see how medical men in those days could have been so unobservant and senseless.

Clark finally comes to a better diagnosis. He wrote "poor Keats has had another bleeding from the lungs and is greatly weakened. He is now in a deplorable condition and is greatly weakened. His stomach is ruined, and the state of his mind is the worst possible for one in his condition. His lungs are also diseased." At last the reeking disease, crying out for recognition by every sign and symptom of phthisis, spat its identity at the doctor. Osler remarks in his admirable essay that "Keats had none of the *spes phthisica* that consumptives have, that carries them hopefully to the very gates of the grave."

Keats, the Grecian pagan, had no

religious faith. He did not believe in God or in a hereafter; he had no religious comfort. Severn read Jeremy Taylor's "Holy Dying and Living" to him without avail. He never saw his sweetheart or his family again. He died February, 1821, in Severn's arms, faithfully but stupidly attended by the doctor who gave him no relief. His mental state at the end may be described by saying that he had the horrors. He had no "easeful death." He did not "call death soft names in many a mused rhyme." Nor did he "cease upon the midnight with no pain." An autopsy revealed that "both lungs were gone," to quote Severn. He was interred in the Protestant cemetery in Rome.

Severn was directed by Keats to have inscribed on his tomb the epitaph that is only too well known,

Here lies one whose name is writ in water.

The many friends of the poet all thought that the attacks by the reviews were the sole cause of his death. I am sure that they liked to think so. Many had themselves been scored by the dastards Lockhart and Wilson. When Lamia appeared a copy was sent to Byron by his publishers. Consumed with jealousy and rage, this poet wrote to his agents and told them he did not want such books sent to him. His letter was so vulgar and obscene that it has never been published in its entirety. In it Byron speaks of his rival as "the dirty little blackguard Keats." After Keats' death in some unfeeling doggerel lines, he alludes to the review attacks and their lethal rôle:

> Strange that a mind, that fiery particle
> Should be snuffed out by an article.

Shelley wrote in the preface to his poem Adonais:

> The savage criticism on his Endymion . . . produced a most violent effect upon his susceptible mind; this agitation thus originated, ended in the rupture of a blood vessel in the lungs, a rapid consumption ensued, and the succeeding acknowlegments from more candid critics of the true greatness of his powers were ineffectual to heal the wound thus wantonly inflicted.

Again in biting, scathing terms, he continues, "Miserable man, you, one of the meanest, have wantonly defaced one of the noblest specimens of the workmanship of God. Nor shall it be your excuse that, murderer that you are, you have spoken daggers but used none."

This was the universal opinion of the literary men, friends of Keats and probably of his doctors. "The poor fellow seems to have been hooted from the stage of life," continues Shelley. So nobly incensed was he that Adonais was written. It is one of his greatest and in some respects his most stately and sustained work. It ranks with the other great elegiac poems, mourning the loss of the youth, extolling his art, and pours scorn and contumely upon his critics. This beautiful and lovely work in turn was also reviewed by *Blackwood's*, and a parody written upon it.

Adonais begins in stately measures, full of real grief and feeling,

> I weep for Adonias, he is dead,
> O weep for Adonias, though our tears
> Thaw not the frost that binds so dear a head.
>
> . . .
>
> Forget the past, his fate and fame shall be
> An echo and a light unto eternity.

The parody,

> Weep for my Tom cat, all ye Tabbies, weep,
> For he is gone at last, not dead alone
> In flowery beauty sleepeth he no sleep,
> Like that bewitching youth Endymion.

Some years afterwards Hazlitt, still raging at the *Blackwood's* gang and having some grievances of his own, due to adverse sneering, criticisms, wrote this half-lyrical outbrust:

> Shelley died with a volume of Keats' poems clasped with one hand on his bosom [every one knows that he was drowned] . . . Keats died young and "yet his infelicity had years too many." A canker had blighted the tender bloom that o'er spread a face in which youth and genius strove with beauty, the dart was sped venal, vulgar, venomous, that drove him from his country with sickness and penury for companions and followed him into his grave. And yet there are those who could trample on a faded flower —men to whom breaking hearts are a subject of merriment, who laugh loud over the silent urn of Genius and play their game of venality and infamy with the crumbling bones of their victims.

I am sure that every member of the medical profession will have to own that the doctors who served Keats had very much more to do with the course of his illness and death than any reviewers. Their mistakes were largely because of the times in which they lived. Then, too, obvious lack of plain common sense and powers of observation contributed much to the mismanagement and untimely death of this genius. Laennec had lived in the lifetime of the poet. His discoveries in physical diagnosis were probably not in vogue at the beginning of the 19th century. It is doubtful if any of the poet's doctors examined his chest, or knew how to make such examinations. His life was not "snuffed out by an article," but because his medical advisers had not the knowledge or the common sense with which to recognize and to treat tuberculosis properly.

No other poet could so splendidly sing such a requiem as Shelley did for Keats in Adonais. In the fifty-five stanzas he pours forth his soul in undying measures. If it had not been for the review attacks it is doubtful if he would have been so stirred. This "most musical of mourners" chants:

He has outsoared the shadow of our night,
  Envy and calumny and hate and pain
And that unrest which men miscall delight,
  Can touch him not and torture not again.

THE PAPYRUS EBERS

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A NUMBER of years ago, while a medical student, I heard one of my instructors remark that diabetes was a disease of such great antiquity, that it was mentioned in the Papyrus Ebers, a medical document that was already ancient when Moses was a boy. When Moses was a boy! To think of this generation possessing and reading a document that was very old when little Moses was put in "an ark of bulrushes daubed with slime and pitch which was laid in the flags by the river's brink!"

The name Ebers seemed the name of an old friend. At first I could not place him but then remembered that as a boy I had read "The Bride of the Nile" and "Uarda." Both novels made a great impression upon me and I remembered dimly that the librarian had told me that these novels were written by a learned German professor who had spent his entire life studying Egypt.

A recent visit to the University Library at Leipzig whose chief treasure is the Papyrus Ebers, the acquisition of a facsimile of the papyrus issued under Eber's editorship and of Joachim's translation, are the extenuating circumstances for this brief sketch of the Papyrus. Dr. Heinrich Joachim who made the first complete translation explains in the introduction to this translation how he, a practicing physician in Berlin came to translate an Egyptian papyrus. He relates that many years before, he had become interested in the medicine of the ancient Egyptians, but found that he could not go very deeply into the subject because so few of the papyri relating to medicine had been translated, and accounts of Egyptian medicine found in the old Greek and Roman writers were unsatisfactory. Joachim resolved to learn Egyptian and after many years of study, mastered the language sufficiently to undertake a complete translation of the Papyrus Ebers. I cannot claim either the praiseworthy industry or the remarkable erudition of Joachim. I can, however, express grateful thanks that we have the fruits of his industry, and even the most cursory and superficial examination of the papyrus will lead us to say Amen when we read from Joachim's pen that in translating the papyrus he found "die Schweirigkeiten, die dabei zu überwinden waren, waren ungemein gross."

Just who was Ebers after whom this, perhaps the finest of all Egyptian papyri, was named? George Moritz Ebers was born in Berlin in 1837, became docent in Egyptology at Jena in 1865 and became professor of the same subject at Leipzig in 1870. In 1872 he came into possession of the papyrus which later bore his name and in 1875 he issued a facsimile of the papyrus with a partial translation, the complete translation by Joachim appearing in 1890. Ebers had that divine spark of a true teacher, the great desire to interest people in the things that interested him. He conceived the idea of popularizing Egyptian lore by writing a series of historical romances woven about characters, events and customs of ancient Egypt. His first novel, "An Egyptian Princess," which appeared in 1864, had an immense success and was followed by a series of similar romances the best known of which are, "Uarda," "Seraphis," "The Bride of the Nile" and "Cleopatra."

These novels, we are assured by literary critics, do not possess a very high literary value but they contributed in no small measure to making the public familiar with the discoveries in Egypt. Ebers died in 1898, nine years after his retirement from the chair at Leipzig. How happy Ebers would have been had he been living when Tut-an-Khamen's tomb was opened! As an Egyptologist, the discoveries would have thrilled him, but even more would he have rejoiced at the public's interest in old Egypt. For many days at a time "old King Tut" was the leading news person of the day in the newspapers and crowded off the front page presidents, prime-ministers, senators, yes, even prize fighters and movie stars.

In 1875, as noted before, the facsimile of the papyrus appeared from the press of Wilhelm Engelmann in Leipzig, with the title "Papyros Ebers, das hermetische Buch über die Ärzeneimittel der alten Ägypter in hieratischer Schrift herausgeben, mit Inhaltsangabe und Einleitung versehen von Georg Ebers." It appeared in two volumes, volume two containing a dictionary of Hieroglyphics and Latin by Ludwig Stern. It is a beautiful example of German book art at its best. The reproductions of the papyrus are so startlingly exact that one frequently has the impulse to pick up the sheet of papyrus from the page to examine it more closely. The book, in addition to the facsimile reproductions, gives a partial translation of the papyrus, the history of its discovery and a discussion of its age, contents and importance in the history of Egyptian medicine.

During the winter of 1872–73 Ebers and his friend Stern were in Thebes examining some of the ancient Egyptian tombs. The inhabitants there carried on a small traffic in antiques and one day a native, after having made vain attempts previously to interest Ebers, called the German scholar and told him he had a real treasure. The Egyptian had a tin box from which he pulled out a large papyrus in a splendid state of preservation. Ebers says, "the valuable papyrus was unrolled and I can with difficulty describe the impression which this noble, magnificently written and preserved memento made upon me." The native asked a rather high price for the papyrus, and Ebers became uneasy because he learned that a representative of the British Museum was in Luxor and was seekto acquire the papyrus. Fortunately for Ebers, a wealthy German merchant appeared upon the scene and advanced Ebers the money necessary for its purchase.

The papyrus had been found about 1858 between the legs of a mummy in one of the graves of the Necropolis of Thebes. It was a single rolled piece of papyrus measuring 30 cm. (12 in.) wide and 20.23 meters (*ca.* 66 ft.) long, and in such a perfect state of preservation that not a single letter is missing or imperfect.

Ebers with his new treasure on board, sailed down to Cairo whence he made his way homeward, going through Italy. He lingered a bit in

Italy, unrolling and studying his treasure, and by the time he reached home he had a fairly clear idea of its contents. As soon as he reached Leipzig, King John of Saxony sent for him and showed great interest in the papyrus which Ebers explained to him. A few days later it was presented to the Library of the University of Leipzig. Ebers immediately began to prepare the edition and translation which appeared two years later.

The papyrus is not written in hieroglyphics but in heratic, which was commonly used for writing papyri and corresponds in English to the script used for writing, while the hieroglyphics constituted the "printed language" of ancient Egypt. The tombs and monuments of ancient Egypt are covered with inscriptions in hieroglyphics as we today employ printed letters, while manuscripts were in hieratic, the letters used in correspondence. Then also, as now, individual writers had peculiarities in penmanship and different ways of writing the same letter, a circumstance which makes hieratic somewhat more difficult to read. However we must pay tribute to the penmanship of the author of this papyrus in that we, three thousand, five hundred years later, can read his prescriptions. Could the same be said of most of the prescriptions we write every day?

Ebers, after a careful study of this papyrus, placed its age at approximately 1552 B.C., during the reign of Amenhotep I, about two hundred years before Tut-an-khamen ("King Tut"). Later students of the papyrus have in the main agreed with Ebers, some believing, however, it may be even older. Joachim has pointed out that one prescription was written for King Usaphais who reigned 3700 B.C. Joachim believes the papyrus was compiled about 1552 B.C. but contained many prescriptions taken from much more ancient medical works.

1552 B.C.! This was about the time that Abraham, following Jehovah's command, left the ancient city of Haran to found a new nation. It was about the time the Iliad and Odyssey appeared among the people of Greece as folk tales, although Homer was not to write his great epics until five hundred years later. It was three hundred years before Moses was born, a thousand years before the birth of Buddha, of Confucius and of Hippocrates!

Clement of Alexandria, the Greek Father of the Church, who was born about A.D. 150 and who was very familiar with Egyptian culture, wrote that the Egyptians possessed forty-two hermetic books, that is, books given to man by the god Hermes (Thoth) and that these books, of which six were medical, contained all knowledge. Ebers believed this papyrus to be one of these six books, that treating of pharmacy (περί φαρμάχων). This has, however, been questioned by other authorities who have considered it a compilation in an edition de luxe executed for some temple. Joachim who studied the papyrus carefully found notations here and there such as "found damaged," which he felt was good evidence that this papyrus was a copy made about 1550 B.C. of a still more ancient document. Ebers believed to the last in the correctness of his opinion. He also pointed out that Hippocrates was familiar with the writings of the Egyptian physicians and doubtless with the so-called hermetic books. This again rather staggers the imagination when we reflect that this papyrus is, in modern parlance, one of the editions of the textbook in medicine used by Hippocrates while a student, part of the training that produced the immortal Father of Medicine.

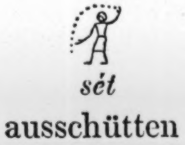


FIG. 1. HIEROGLYPHIC CHARACTER FOR "POUR OUT."

The text of the papyrus is written in black, the rubrics in red. It begins in a stately, majestic fashion as though written to be intoned in a temple. "Here begins the book on the preparation of medicines for all parts of the body. I came from Heliopolis with the priests of het-āāt, the god of refuge, the king of eternity and salvation. I came from Sais with the goddesses who gave me their protection. Words were given me by Lord of All to drive away the ills of all gods and the deadly diseases of every kind." It continues, "he who loves god, god makes to live. This is the book of the healing of all diseases. May Isis heal me, as she healed Horus from all the suffering that his brother Set caused him, when he killed his father Osiris."

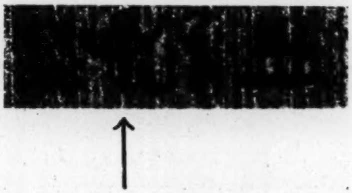


FIG. 2. HIERATIC TRANSFORMATION OF SAME CHARACTER AS THAT IN FIG. 1. CHARACTER FOR "POUR OUT" IS INDICATED BY ARROW.

The document then plunges immediately into medicines, "to drive away the illness in the body" and gives a long list of cathartics among which may be noted one prescription containing figs and sweet beer, another composed of wine, honey and herbs and another medicine "to open up the body," containing milk, honey and bread dough. Is this last prescription the introduction of yeast into medicine for the treatment of intestinal disorders?

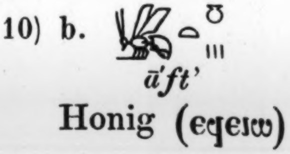


FIG. 3. HIEROGLYPHIC CHARACTER FOR HONEY WRITTEN FROM LEFT TO RIGHT.

One disease that is frequently mentioned and for which remedies are prescribed is the mysterious āāā disease. There has been much speculation as to just what this disease was. Some have thought it to be dysentery and others bilharziasis. Joachim thinks the passage on page 19 of the papyrus describing an excellent remedy for driving out "the worms in the body which were produced by the āāā disease," important evidence that the disease in question is ankylostomiasis, the chlorosis Egyptica of modern writers. He points out that Lutz in his classic work on ankylostoma duodenale portrays a clinical picture that might have been taken from the Papyrus Ebers, with such expressions as "pains in the heart region," "heart weakness" and "palpitation of the heart."

FIG. 4. HONEY AS IT APPEARS IN THE HIERATIC SCRIPT OF PAPYRUS EBERS. HIERATIC CHARACTERS WRITTEN FROM RIGHT TO LEFT.

The hieroglyphic character used by the Egyptians to designate the āāā is the phallus (i.e. penis and testicles) which is written in the heratic script of the papyrus as shown in Figure 7. Joachim believes this is additional evidence in favor of his viewpoint, since severe cases of chlorosis Egyptica causes impotence in the male and sterility in the female. Some of the prescriptions for the āāā disease contain absinthe, beer and honey; others rosin, figs, crocus and many plants which cannot be identified. Many of these prescriptions may have contained substances having an antihelmetic action.

The pediatrician and obstetrician may be interested in the following passage, "The prognosis for a child on the day on which it is born; If it cries nee, it will live; if it cries ba, it will die." The pediatrician may also learn that a good method to produce urination in a child is to take an "old book cooked in oil and smear over the abdomen," perhaps a type of warm poultice.

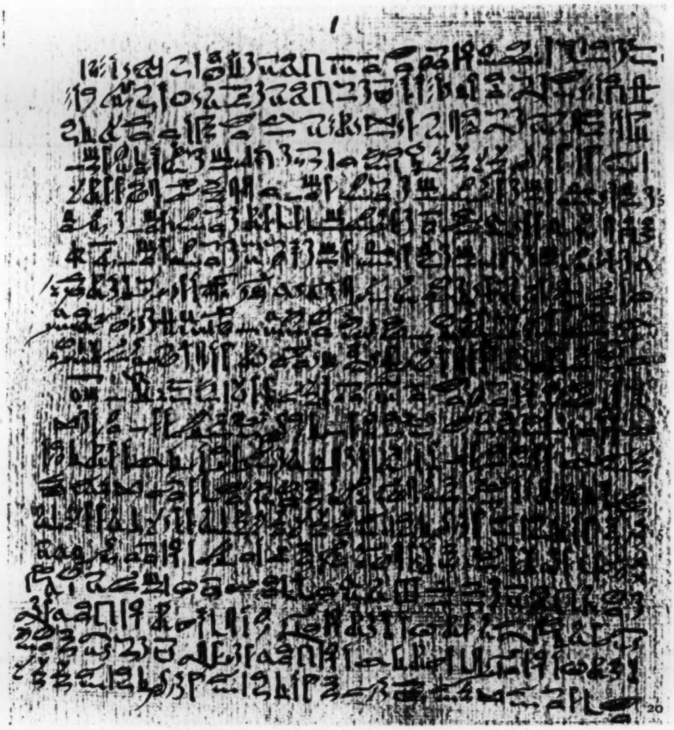


FIG. 5. PAGE ONE OF PAPYRUS EBERS.

The ancient Egyptians, as well as the modern, were evidently heavily infested with intestinal parasites. Many prescriptions are given for the pend-worm, which Joachim identifies with Tenia mediocanellata (Tenia saginata, the common tapeworm), and for the heft-worm which is evidently Ascaris lumbricoides. Lactuca, absin the, dried sycamore, figs, dates, onions, castor-oil beans and the roots of pomegranate trees, are among the remedies recommended for these worms.

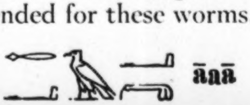


Fig. 6. Hieroglyphic Characters for āāā Disease Written Left to Right.

Much interest has been aroused by the prescription, "to drive away the too much emptying of urine" (polyuria). This has been generally held to refer to diabetes, a disease that could scarcely have escaped the notice of the ancient Egyptians. The prescriptions, containing cakes, wheat, corn and grits could not have been of any great value but at that quite as logical as some of the prescriptions used three thousand years and more later. The illustrious Sydenham who flourished more than three thousand years after the compilation of the papyrus Ebers, it may be recalled, prescribed in diabetes such remedies as crystalline sugar, balsam of Peru, gum arabic, Venice treacle, candied ginger and candied nutmeg.

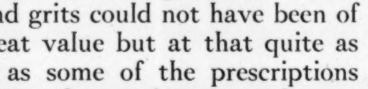


Fig. 7. Hieratic Characters for āāā Disease in Papyrus Ebers Read Right to Left.

Ancient Egypt was noted for its ophthalmalogists and we read at a much later date that eye-specialists were summoned from time to time to treat Greek and Roman celebrities. So it is not surprising to find an extensive section of the papyrus with the title "Here begins the Book on the Eyes." In this chapter a number of eye diseases have been identified from the descriptive terms employed. In the list are conjunctivitis, iritis, keratitis "mouches volantes" hypopyon, chalazion, xanthelasma, amblyopia, blepharitis, pterygium, cataract, strabismus, subconjunctival hemorrhage, albugo, dacro-cystitis and granulated lids. There are also many other conditions which have not been identified. The Egyptian ophthalmalogist doubtless saw trachoma but it cannot be identified in this papyrus. It is interesting to note that miotics are mentioned, "for the narrowing of the pupils filings of ebony wood and saltpeter."

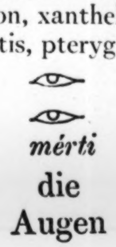


Fig. 8. Hieroglyphic Characters for Eyes.

Many of the prescriptions seem childish and amusing, while others are probably just as effective as those we use today. Their complicated prescriptions for "mouches volantes" probably did just as much as our prescriptions today, that is, nothing much. Many of their eye-washes used in inflammation of the eye contained small amounts of zinc, of lead salts, with large amounts of water, mild astringent lotions just as effective as our ubiquitous boracic acid lotions.

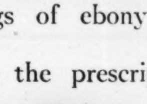


Fig. 9. Hieratic Characters for Eyes.

For albugo or corneal opacity, the Papyrus recommends powdered granite, placed on a cloth and applied to the eye. Richard Mead in his "Medical Precepts and Cautions," 1751, thirty-three hundred years later, advised powdered glass. The Ebers Papyrus rather non-commitally refers to the prescription as a "remedy to drive away albugo," Mead, however, states positively that "a little of this powder put into the eye with a quil every day, gradually absterges and wears off the spot by its inciding quality . . . I have seen several instances of cures by the eye-powder." These irritating powders would produce a mild inflammation and act very much in the same way as modern instillations of dionin or similar substances which are often very beneficial. The Egyptians probably treated eye-diseases with as much success as did their professional descendants up to the time of the development of surgery.

One very interesting section relates to tumors and diseases of the uterus and vulva. One prescription for "gnawing in the vagina" contained fresh dates, pig bile, cassia and water to be used as a douche. An important chapter begins with the inscription, "here beginneth the remedies to drive vermin out of the house." The reader is advised to keep a snake out of the house by finding its hole and putting at the entrance natron and garlic. If we do this, "he will not crawl out." Remedies against wasp-stings, spider-bites, methods of driving away ants, mice and scorpions are described here.

That perennial optimist, the bald-headed man, will doubtless be interested in the chapter, "Here beginneth the medicines to remove gray hair and to preserve hair." Joachim pointed out that most of the pomades and salves mentioned in this chapter contain black substances or substances from black animals.

These prescriptions for dyeing hair are quite fantastic in many instances. Bile from a crab, the blood from a black cows horn warmed in oil, are among the hair dyes recommended. A very complicated prescription "to drive away gray hair" contains roasted hoof of an ass, the vulva of a dog, a portion of hemit grains, rubber, a black ascaris worm, all cooked in oil and rubbed into the scalp.

The bald-headed man will perhaps have even greater interest in a paragraph in this chapter entitled "the beginning of the remedies to make the hair grow." One prescription recommends ink mixed with cerebrospinal fluid, another, sliced lettuce placed upon the head. One prescription consisting of the fats of the wild cat, hippopotamus, crocodile, cat, snake, and ibex, is designed for the "growth of hair upon local areas of baldness," a passage which probably describes alopecia areata. Palm oil, honey, various fruit juices and kernels all have their place among the numerous remedies for baldness.

Another prescription reads, "another remedy for making the hair grow, prepared for šeš Mother of His Majesty the King of Upper and Lower Egypt, the late tetå; the claws of a dog, dates and donkey hoofs equal parts." This prescription recalls an event much much later, in A.D. 79, when Pliny the Elder, who was in command of the naval port of Misenum, went ashore at Stabiae near Pompeii to observe the eruption of Vesuvius. It will be remembered that Pliny went to the home of his friend Pompianus with whom he dined. The account of this dinner and their conversation has been preserved, thanks to the younger Pliny, who reported everything with the fidelity of a well trained newspaper correspondent.

"Let me recommend you a hair restorer," said Pliny.

"I generally use donkey's hoof, boiled down and dogs' claws and dates," Pompianus answered. "It is an Egyptian recipe, used, I believe by the great Cleopatra, and also by Poppaea, the wife of Nero."

"Well, she certainly had beautiful hair," Pliny remarked. "I remember being taken in to see her one day when she was having it combed, that was just before Nero kicked her to death."

These old prescriptions have a familiar ring in these days of the ubiquitous beauty parlor. All that is lacking to create this barber-shop atmosphere is some remark about the hairs being hollow tubes and the necessity of singeing their ends to prevent the vital fluid from escaping. I will not be so uncharitable as to draw the dermatologists onto the scene.

One of the most interesting sections of the papyrus is the ninety-ninth page, which begins as follows:

> The beginning of the secret book of the physician, the knowledge of the action of the heart and knowledge of the heart. Running from the heart are the vessels to all parts of the body. Every physician, every priest, every magician, when he lays his fingers upon the head, the hands, the epigastrium, the arms, the legs, feels really the heart, since his vessels run to all members of the body, for that reason the heart is called the center of the vessels of all organs.

This passage probably refers to the pulsations felt in various parts of the body and the recognition of this relationship to the heart beat. It may be recalled that Herophilus of Alexandria (330 B.C.) studied the pulse and noted that it was synchronous with the heart beat.

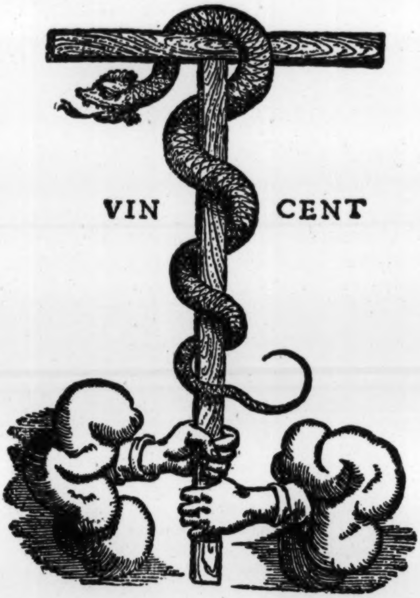
The anatomical treatise in the papyrus then proceeds to say there are four vessels to the nostrils, four to the temples, four to the ears, two to the testicles, four to the liver, "two to the bladder which produce urine" (evidently a confusion with the ureters). Then follows a description of various cardiac conditions, "feeling pressure on the heart" (angina pectoris?), "fatty disease of the heart," "weakness of the heart due to old age," "trembling of the heart" (auricular fibrillation or extrasystoles?).

The section on anatomy is followed by a treatise on tumors, under which we find descriptions of tumors of the throat, fatty tumors, pus tumors (abscesses) of the neck, skin tumors and tumors in the muscles. In speaking of tumors in the head which "seem to contain fluid" which are "grown to the skin, softened and not too large," say, "I will treat the disease . . . Treat it with the knife, but look out that you avoid the blood-vessels." For tumors of the muscles, the papyrus says, "treat it with the knife and burn it out with fire to keep it from bleeding."

The section on tumors brings the Papyrus Ebers to an end. It is of course impossible to recognize many of the conditions described. It is probable that various abscesses, malignant growths, wens, parasitic cysts are included under the Egyptian term *safet* and *uxedu*. Of particular interest is the frequent advice to open the tumor with a knife and let the fluid escape, the repeated references to cauterizing the wound with a red-hot iron and the warning to "look out and avoid the blood-vessels."

The philosopher has often reminded us that human nature has changed little, at least as far as we can judge from written records of the past. The Papyrus Ebers shows us that not only the failings of the spirit but the ills of the body have not changed materially. Ruffer has described for us a case of Potts' disease with a psoas abscess in a mummy dating back to 1000 B.C., multiple kidney abscesses in a mummy of circa 1500 B.C., in which gram-negative bacilli could be demonstrated (B. coli?) and the eggs of Bilharzia hematobia in the renal tubules of a mummy circa 122 B.C. This same authority found what was probably smallpox in a mummy and there are passages in the Papyrus Ebers which seem to describe this disease.

Verily "one generation passeth away and another generation cometh; but the earth abideth forever . . . Is there anything whereof it may be said, See, this is new?"



TUBERCULOSIS AND GENIUS AS MANIFESTED IN ST. FRANCIS OF ASSISI

By LEWIS J. MOORMAN, M.D.

OKLAHOMA CITY

IN many individuals suffering from tuberculosis there seems to be a strange psychological flare, a phenomenon not fully accounted for, not of established scientific lineage, yet quite evident to the student of clinical tuberculosis. Everyone who deals with tuberculous patients in institutions knows how patiently they bear their lengthening burdens; how courageous they are, often in the face of insurmountable obstacles; how optimistic they may be when life is literally being cut down by the inevitable sweep of the Great Reaper. Precious paradox, this, with death so near and life so abundant. This unusual display of courage and optimism has been termed *spes phthisica*. Charles Dickens must have suspected the subtle power of this intangible fraction of the tubercle bacillus when he wrote as follows:

> There is a dread disease which so prepares its victim, as it were, for death; which so refines it of its grosser aspect, and throws around familiar looks unearthly indications of the coming change—a dread disease, in which the struggle between soul and body is so gradual, quiet, and solemn, and the result so sure, that day by day, and grain by grain, the mortal part wastes and withers away, so that the spirit grows light and sanguine with its lightening load, and, feeling immortality at hand, deems it but a new term of mortal life—a disease in which death takes the glow and hue of life, and life the gaunt and grisly form of death.

If we accept the teaching that there is a dual personality in every individual, the two personal entities being designated as primary and secondary, and the primary personality as that part which conforms to the usual conventions of life, constantly being restrained by established habits and customs, and the secondary personality as that part which under ordinary conditions is kept in leash, but occasionally released through the influence of some subtle force to override all conventions and restraints, we can readily see how the world may be cursed or blessed by the unconventional sway of this secondary personality. In those of superior intellect this release may cause a flare of genius which otherwise might never have been discovered.

Among the factors and forces which seem to destroy inhibition and temporarily set free the secondary personality are alcohol, opium and the toxins of tuberculosis. While scientific proofs may be wanting, it is easy to build up clinical evidence by the enumeration of many cases which have been influenced by these agencies. We are now concerned with the cases apparently influenced by the toxins of the tubercle bacillus. After we allow for the increased mental activity, which is apt to follow enforced physical rest, there seems to be in many cases of tuberculosis a decided excitation of the mind with increased capacity for creative accomplishments.

One of the early outstanding examples of this influence is found in the life of St. Francis. Born of Italian parents within the walls of Assisi, in the year 1182, this child, according to quaint medieval stories, was dedicated to the life of the spirit and the service of mankind. At his baptism his mother gave him the name of John, perhaps thinking of the gentle saint who lived so near his master, or that less saintly and less sensitive John Baptist. However, his father, returning from the gay land of France, was delighted with the lively babe and would have "no John Baptist dressed in camel's hair," but would make of him a Frenchman in character and name, so he called him Francis. No doubt these divergent desires had little to do with the spontaneous flow of his indomitable spirit. While attempting to bring children up in the way they should go, parents should never lose sight of that "divinity that shapes our ends,—rough-hew them as we may." Many fond parental hopes fade before the sweep of this invisible captain who sits at the helm and directs the course of human life.

The child Francis was not robust and his mother watched over him with anxiety. One of his biographers has given us this suggestive picture: "He was a slender boy, delicate of limb and feature, with the straight nose, smooth low brow, and thin tapering fingers of the idealist."

No doubt the toxins of the tubercle bacillus were shaping his body at this early date and exerting their so-called selective action on the sensitive nervous system, inflaming the young mind with dreams of romantic adventure and chivalric deeds, thus unfitting him for the drab business of cloth merchant. He was the ringleader of his crowd, living a joyous, buoyant life, going bravely and blithely into battle against Assisi's rival city, Perugia, to be captured and imprisoned. In the dank, dark dungeon disease developed with dissipation of flesh and strength, but there was no dampening of the spirit. The dungeon rang with his merry songs, his mirthful chatter and his ready wit until his gloomy companions were forced to join in the fun.

After a year had elapsed the prison doors were opened and Francis came forth with wasted form, having lost the outward habiliments of the troubadour. However, neither the body nor the soul of this chivalrous young poet could long resist the alluring charm of the Umbrian plains and Italian skies.

Long before his body was ready for the fray his dreams of horse and arms and deeds of chivalry carried him clattering through the gates of Assisi with the hope of a triumphant return to be received like a great Prince. While he was still on the road to the battlefield of his dreams, the old war between body and disease was raging with disease in the ascendancy. When prostrated with fever and weakness, he knew his impetuous spirit had carried him too far. Under the cloud of defeat and humiliation another dream carried him back to his beloved Assisi. While groping in the valley of disappointment where all things beautiful were concealed by the veil of uncertainty, he met his leper; his spiritual genius was released as he fell on the leper's neck. He had dissipated all fear; he had proved himself master on the "field of valor." The ministry of love was launched and the valley of disappointment was gradually transformed into a place of beauty with certainty of purpose flanked by mountains of opportunity.

Soon after this, in answer to a voice from heaven, came the rebuilding of the Church of St. Damian. The mysterious driving force behind his sensitive nature carried Francis precipitately into every undertaking. On this occasion he committed a sin, in the eyes of the world, by overriding convention and making his father an unconscious participant in the building process. After first selling his own horse, he took goods from his father's shop in order to secure funds with which to rebuild the church. These goods, however, were not employed for this purpose until after he had made the sign of the cross over them. His father being thus forewarned of what he considered inevitable disaster, decided to disinherit him. Being apprised of this, Francis threw his clothes at his father's feet with the retort "I can now say Our Father which art in Heaven," and went away with only a hair shirt on his body, and a song on his lips.

He apparently courted poverty and was content to go about in rags begging for his food. It is said that he exchanged clothes with a beggar, discarding the girdle for a piece of rope which chanced to be near. "Ten years later that make-shift costume was the uniform of five thousand men; and a hundred years later, in that, for a pontifical panoply, they laid great Dante in his grave."

Through his debasement of self, his devotion to spiritual things and his unstinted service to his fellow men he succeeded in founding the Franciscan Order and became the immortal St. Francis.

With the same urge which carried him furiously into battle, making it impossible for him to recognize his physical deficiencies, he now flung himself into the pursuit of divine love, accepting poverty, fasting and suffering as stepping-stones to higher planes of living, ever marching forward with songs of praise in his heart until in his death agony he wished to lie bare on the bare ground to show that he had nothing and was nothing. Without our attempting to catalogue his thoughts and deeds, it is easy to see that the life of St. Francis was consistently inconsistent, conventionally unconventional. Evidently his secondary personality was in the foreground and his genius was at large.

St. Francis was only forty-six when he died, but he was prematurely old. Between disease, fasting and fighting, his energy was spent, but his spirit still gave off sparks when exposed to the hammer. Though his life was now saddened by physical debility and his failure to "end the crusades by the conversion of Islam," imagine his disappointment when he was told that he was going blind and only the cautery could give some promise of relief. Think what this must have meant to this brother of all living creatures and all things beautiful in the world. But his seeming inconsistency was constant. When the moment for cauterization arrived and the iron was taken from the furnace he said, "Brother Fire, God made you beautiful and strong and useful; I pray you be courteous with me."

After a period of fasting on Mount Alverno it is said that he was no longer able to walk and it was apparent that his strength was spent and that life could not last much longer. Evidently tuberculosis had done its work and no doubt at that very moment "his eyes glowed with the fire that fretted him night and day." Like many other fellow-sufferers, as death approached, he was carried from place to place; even Cortona by the lake of Perugia did not satisfy him, and finally he was stung by the pathetic sense of his homelessness, even though homelessness had been a part of his gospel, and he turned his face toward Assisi; and, if he did not see, with his seared eyes, the Portiuncula, his soul rejoiced when its pillars first appeared to those who were with him and he must have experienced all the glory of homecoming when they placed his dying body in the little room just outside the Portiuncula. With the strange psychic energy which often accompanies the tuberculous into the depths of the valley of death, he emphasized this final sense of place and possession by saying to those about him, "Never give up this place. If you would go anywhere or make any pilgrimage, return always to your home; for this is the holy house of God." After having the brethren sing canticles and psalms in which he joined, he requested that his body be laid on the bare ground in order that his soul might mount unhampered to its source. With the silencing of song and the lowering of the frail body from its crude couch, there must have been a penetrating stillness punctuated by every footstep on the porches of the Portiuncula as the brown figures, suddenly saddened, moved cautiously and aimlessly about.

It was on the third of October, 1226, that tuberculosis won the final victory and forced the separation of spirit and body. Just what the toxins of tuberculosis had to do with the creative energy of this impetuous mind and to what extent it was influenced by the restraining effects of disease upon his physical activities, we can never know, but it is certain that tuberculosis played a part in this unprecedented expression of genius.

St. Francis was chief pathologist at the death of the Dark Ages. With the accuracy which could come only through a fine dissection, he discovered the maladies which had dragged humanity down, and set about to free society from their ravages; as a consequence, he has been called "the morning star of the Renaissance." In the words of Gilbert K. Chesterton:

> From him came a whole awakening of the world and a dawn in which all shapes and colors could be seen anew. The mighty men of genius who made the Christian civilization that we know, appear in history almost as his servants and imitators. Before Dante was, he had given poetry to Italy; before St. Louis ruled, he had risen as a tribune of the poor; and before Giotto had painted the pictures, he had enacted the scenes . . . He was the spiritual essence and substance that walked the world before anyone had seen these things in visible forms derived from it; a wandering fire as if from nowhere, at which men, more material, could light both torches and tapers. He was the soul of medieval civilization before it even found a body.

His charity was as spontaneous, as far-reaching, as godlike as the blue heaven vaulting the plains of Umbria, —as refreshing as a perpetual fountain in an ancient market place. A spiritual genius walking in the shadow of the Dark Ages, yet delicately attuned to all the needs of modern mankind. We bow our heads in humble recognition of his influence in the world today.

THE INFLUENCE OF CLAUDE BERNARD ON PHYSIOLOGICAL CONCEPTS*

By M. H. GOLDSTEIN

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HOPELESSLY inadequate must be the task of anyone who is sufficiently presumptuous to believe that he can depict in any but the most general terms the feat indicated by the title of this paper.

Before Claude Bernard, physiological inquiry was of so haphazard a nature, that with the exception of a few luminous spots here and there, there was almost complete darkness in regard to the technic of animal experimentation and the application of experimental observations to morbid processes. To him, physiology was experimental medicine, and the chief aim of physiological research was to throw light on pathological conditions.

There was little in his early life to indicate the influence he was later to exert on scientific inquiry. His nearest approach to science was an apprenticeship to the local pharmacist.[6] But he aspired to higher things than mixing the unholy decoctions then in vogue, and dealing out pills to the worthy people of Lyons. Struggling within him to find expression was the soul of an artist and the outlet was his undoubted talent in writing.

His first achievement, a vaudeville comedy entitled "La Rose du Rhone," was actually staged with considerable success. Emboldened, he attempted a prose drama, in five acts, "Arthur de Bretagne," and at the age of twenty-one he took this play to Paris, to Saint-Marc Girardin, the eminent critic. Girardin readily perceived that here was talent, but knowing the hardships and trials of a literary life, persuaded Bernard to study medicine and write in his leisure hours. The world owes much to Saint-Marc Girardin for this bit of counsel.

The turning point of Claude Bernard's life was when he became the official *préparateur* to Magendie, while interning at the Hôtel Dieu. Magendie was then the most distinguished physiologist in France, and his influence on Bernard was great, not merely because he served as an example, but because his many errors in hypothesis and method of experimenting told more clearly than words the things not to do in physiological research. Bernard's genius is apparent in his quickness to discern that, in spite of Magendie's prodigious work, his actual discoveries were few. So much was lost effort because of a blind reliance on the experimental facts.

The attitude toward physiological experimentation in France at that time was distinctly discouraging. Vitalism held sway, with Cuvier its chief apostle. The leaders of science did not believe that vital phenomena could be entirely explained on a physico-chemical basis, and as such were not amenable to laboratory methods of study. This attitude, combined with active antivivisectionist legislation, rendered animal experimentation rather difficult. Bernard himself had several unpleasant conflicts with the Parisian Police, until he made friends with the Prefect in his district.

The first published works of Claude Bernard's related to the chorda tympani nerve and the gastric juice, and practically all of his later work dealt with either nerve structures or digestion. His actual discoveries were few, but of so fundamental a nature, and so far-reaching in effect, that there can be said to be few physiological inquiries today that do not make use of one or more of the profound truths he enunciated.

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* Thesis presented to the Department of Physiology, University of Virginia.

Previous to Bernard's work on the pancreatic secretion, the whole of digestion was thought to take place in the stomach. The work of Eberle and Valentine suggested that the pancreas might have a part to play in digestion,[7] but it remained for Claude Bernard to show the true nature of the action of pancreatic juice. He demonstrated the emulsification and splitting of fats, the breaking down of carbohydrates to simpler sugars, and the solvent action on proteins.[3] He considered gastric digestion preparatory to intestinal digestion, and this view is substantially that which is held today. He did not clearly bring out the proteolytic activity of pancreatic juice, since he used the inactivated secretion directly from the gland, but his work was pioneer in character, paving the way for the later researches of his pupil, Kuhne, on trypsin, and the final work of Pavlov and Chepowalnikow on enterokinase. His technic developed the pancreatic fistula, and thus placed in the hands of physiologists a procedure which resulted in many discoveries. This technic was used by Bayliss and Starling in their classic researches on secretion. Pavlov and Heidenhain also used the pancreatic fistula, improved upon it, and brought to light many interesting facts on digestion and the control of secretions.

Practically all of the present-day knowledge of absorption of food materials was determined in the light of Bernard's discoveries relating to intestinal digestion. He showed the fat-splitting power of pancreatic juice, the formation of soaps with the alkaline intestinal fluid, and subsequent emulsification of the unaltered fat so as to facilitate its breakdown. This work was fundamental, and all of the later facts of fat absorption and metabolism are but its legitimate offspring.

It was this picture of fat emulsification that first brought Bernard's attention to pancreatic secretion. This well illustrates the fortuitous character of his greater discoveries, and the peculiar genius of the man in recognizing the importance of such chance phenomena and deviating from his original work to study them. He was investigating comparative digestion in herbivorous and carnivorous animals,[2] and noted that fat introduced into the stomach of a rabbit did not become milky and chyle-like until it reached a point much lower in the intestine than was observed when a similar procedure was instituted with a dog. Believing that some structural difference was responsible for this fact, and noting carefully the anatomical arrangements in both animals, he discovered that the pancreatic duct in a rabbit enters the intestine at a point 8 to 10 in. lower down than it does on the dog, where the entrance is in common with the bile duct. He further noticed that the fat emulsification always occurs below the entrance of the pancreatic duct and never above it, thus excluding the action of the bile. He immediately discontinued his study of the herbivora and carnivora, and investigated the nature of this new phenomenon, which culminated in the discovery of the digestive nature of the pancreatic secretion. This won for him the prize for experimental physiology from the Academy of Science, and informed the world that a brilliant and able experimenter was in its midst.

Perhaps the most important single discovery of Claude Bernard's was the glycogenic function of the liver. The isolation of glycogen, and its identity as an "internal secretion" of the liver directly into the bloodstream, marked the opening of a new field of physiological inquiry. The conception of a substance being elaborated in one organ, and utilized in another part of the body, was entirely new to physiology, and the discoveries and achievements following and directly dependent upon this concept are so manifold and of such vital importance, that one wonders what the state of our knowledge of carbohydrate metabolism and even of internal secretion would be today, had Claude Bernard continued his literary career. Many ramifications of these exceedingly important branches of physiology may be considered as fundamentally indebted to Claude Bernard's "secretion interne." He himself could hardly have realized the far-reaching results of his investigation. He placed in the hands of physiologists the knowledge of another mechanism controlling vital processes, hitherto undreamed of by other investigators.

The present-day views of muscle contraction and carbohydrate absorption are direct descendants of Bernard's discovery of glycogen. It was in connection with this work that his celebrated piqure was discovered. He found that puncture of the floor of the fourth ventricle induced a glycosuria because of the rapid mobilization of hepatic glycogen and its discharge as glucose into the blood stream. This was the first intimation of the nervous control of glycogenolysis, and later investigations of Cannon and Elliott linked this phenomenon with the adrenal influence on glycogenolysis, the puncture acting on the centers of the splanchnic nerves to the suprarenals.

The discovery of the glycogenic function of the liver is another example of Bernard's taking advantage of certain unlooked-for phenomena during the course of an experiment. He was interested in diabetes, and in his investigations fed animals on a diet rich in sugar, and then examined the blood at different places to determine the place of destruction of this sugar. He also did comparative examinations of the blood of a dog which had received no sugar in its diet, and discovered an abundant presence of sugar in the hepatic vein, although none was present in the portal. The liver, then, evidently manufactured sugar out of certain substances brought to it by the blood. His later work showed that the sugar was not formed as such, but had a precursor in the liver which he called glycogen (sugar-former), and which produced sugar after the action of certain enzymes.

This discovery was important in a general way, since it destroyed the then dominant conception that an animal was incapable of synthetisizing any of the staple foodstuffs, but ingested them as such in the form of plants and other animals. This was considered to be a vital difference between plant and animal life, and although vigorously controverted by other authorities, received its death-blow from Bernard.[1]

The present-day studies of nutrition and dietetics are greatly indebted to this fundamental work of Claude Bernard, in establishing the fate and mechanism of utilization of carbohydrate foods.

An indirect effect of the discovery of the glycogenic function of the liver was the knowledge that an organ might have more than one function. This proved to be an extremely valuable aid to future physiological inquiry. In previous work, if a function was discovered for a certain organ, it was thought that further investigation was unnecessary for that particular organ and it was usually deserted for other fields. Claude Bernard's endowment of the liver with a function other than the formation of bile brought to the notice of physiologists for the first time a new concept, that an organ may have a duality of activities. This started many experimenters to retrace their steps, and to study more carefully the potentialities of structures, even though well-defined functions had already been attributed to them. Thus the double function of other structures was established, including the pancreas, with its external and internal secretion, knowledge which may be said to have led to the discovery and isolation of insulin.

This discovery also called attention to the physiological potentialities of the liver, and naturally excited much investigation of that organ, with the result that now it is believed to be involved in the formation of urea, of fibrinogen, of hemoglobin, and the detoxication of certain organic poisons and products of putrefaction.

The classic researches of Meyerhof and of Hill in establishing the glycogenic basis of muscular contraction, would indeed have been hardly possible without Bernard's discovery of glycogen. The distinction of this discovery lies in the fact that it represents the work of Claude Bernard only —it was his own initial observation, his own research, and his final extraction of the substance itself.

The third great contribution of Claude Bernard was the discovery of the vasomotor nerves. This was also accidental, in that it was an unlooked-for observation. He was determining the effect of section of certain nerves on nutrition and heat production in the tissues they supply. He believed that the nerves were the factors controlling heat production, and was greatly surprised to find that section of the cervical sympathetic in the neck of a rabbit caused a marked increase in the heat production, instead of the expected fall. He also noted the accompanying vascular congestion, but did not correlate the two, since he firmly believed that nervous influences were sufficient to account for the thermal change. It remained for Brown-Sequard[4] to identify the increased heat as due to paralysis of the blood vessel wall, resulting in vascular dilatation and congestion.

Bernard himself discovered the vasoconstrictor and vasodilator fibers to the submaxillary gland, running in the sympathetic and chorda tympani nerves, and clearly demonstrated their action and significance. But he always maintained that the nerves played a direct part in the increased heat, and that vascular effects were not alone responsible.

The discovery of the vasomotor nerves was perhaps the greatest single contribution to knowledge concerning the circulatory system since Harvey's discovery of the circulation itself.

It established the reflex control of circulation, and was of immense value in clearing up heretofore obscure physiological and pathological phenomena which had been considered vital processes, and therefore not explainable on a physico-chemical basis. The congestion and dilatation observed in inflammation, long baffling to pathologists in explanation, could now be satisfactorily interpreted on a vasomotor basis. The obscure etiology of Raynaud's disease cleared up when its relation to vasomotor activity was established. The whole physiology and pathology of hypertension was so modified by this discovery as to be hardly recognizable. The relation of surgical shock to splanchnic vasodilatation was shown, and this condition treated by the application of physiological principles.

Subsequent work has shown that practically every tissue and structure in the body is supplied with vasomotor fibers, and as such are amenable to reflex control. The remarkable researches on the action of adrenalin, the effects of fear and emotion on the intact organism, and the reflex equilibrium between the animal and its environment, are directly interwoven with vasomotor activity. The effect of the peripheral resistance on blood pressure has become a valuable conception in the work of physiologists and pharmacologists in recent years.

So fundamental was this concept of vasomotor control, that it is today one of the greatest and most secure foundations of physiological and pathological thought. It has its application in the physiology of muscle, of nerve, of secreting gland, of every tissue and organ in the body. It shed a flood of light on obscure and isolated observations, and welded a mass of seemingly irrelevant facts into a concrete, coordinated structure.

These three remarkable discoveries of Claude Bernard's found physiology at a time when it was just beginning to emerge from the darkness which enveloped it, and left it a shining edifice of scientific truth, a science among sciences and placed experimental medicine on a firm foundation.

The lesser achievements of Claude Bernard are lesser only in comparison with his greater works. They would be notable discoveries coming from other workers of his time.

He was curiously attracted to the action of poisons, and believed them to be extremely sensitive devices with which to elicit physiological responses. He was no toxicologist in the strict sense of the word, and his investigations of poisonous substances were dictated by purely physiological motives. Nevertheless, his researches on curare and carbon monoxide poisoning form an important chapter in toxicological study.

Curare is a poisonous substance used by the South American Indians for dipping their arrowheads. Bernard began experimenting with this substance and demonstrated its action with some thoroughness.[2] He showed that it was innocuous when swallowed or when taken into the alimentary canal, but that even a minute quantity in the circulating blood is rapidly fatal. In analyzing its action, he found that it abolishes reflex activity, and localized the point of action in the myoneural junction of the efferent nerves. The sensory and central nervous elements are not involved except in very large doses. Bernard discovered these facts several years before he published them; and in the year of publication, Kolliker at Wurzburg[3] independently arrived at the same results. Priority has been generally conceded to Bernard, however.

The important physiological application of this work was that it completely established the independent irritability of muscular tissue, a controversial subject at that time. By blocking the action of the nerve at the end-plate with curare, and then exciting the muscle directly, he conclusively demonstrated that the muscle is not dependent upon the nerve for its irritability.

A great deal of Bernard's earlier work dealt with variations in the color of blood, and it was this, he says,[1] that excited his interest in carbon monoxide poisoning, the characteristic feature of which is the bright, cherry-red color of the blood in the poisoned animal. He demonstrated that the toxic action of carbon monoxide is due to its forming a stable compound with the red corpuscles, displacing the oxygen, and producing death from asphyxia, because of the exclusion of available hemoglobin from the circulating blood.

The physiological importance of this investigation lies in its being the first indication that gases may be held in the blood in chemical combination, the work of Magnus' indicating that oxygen and carbon dioxide were carried in simple solution in the blood. This concept paved the way for the later researches of L. Meyer, and Hoppe-Seyler, and of his pupil, Paul Bert, on the conduction of oxygen by the red blood corpuscles.

This work also rendered a distinct service to toxicology by showing the mechanism of action of the poison, from which knowledge the treatment of poisoning in man was made possible and feasible. He also noticed that blood exposed to carbon monoxide will give up oxygen in direct proportion to the amount of carbon monoxide absorbed. This phenomenon was taken advantage of by later workers, and used as a method of determining the amount of available oxygen present in a sample of blood. Haldane especially used this technic, modified for his type of respiratory work, and considered it superior to aerotonometer methods.[8]

Claude Bernard's work on paralytic secretion is of no great importance, although it has as yet received no satisfactory explanation. Pavlow believed it to be due to release of the gland from certain inhibiting influences mediated through the chorda tympani nerve, and it has also been thought to result from the temporary stimulation of the cut fibers by the degenerative processes set up in the nerve trunk.

He also made many observations on the cranial nerves, in line with Magendie's work. In connection with the spinal accessory nerve, he noted that both structures supplied by it also receive nerves from other parts of the central nervous system. Its internal branch passes to the larynx by way of the recurrent laryngeal, and its external branch passes to the trapezius and sternocleidomastoid muscles. It was believed by many physiologists, including Sir Charles Bell, that a double nerve supply to a structure was simply to aid in its function. Claude Bernard interpreted this double nerve supply to indicate the performance of two different functions, usually antagonistic.[5] Because of the close connection of the spinal accessory to the vagus, he believed the former to have a respiratory function also, inhibiting respiration in case of speech (internal branch) and muscular strain (external branch).

His lectures, delivered at the College of France and the Sorbonne, were collected and carefully published by his talented pupils, and greatly enriched the then meager physiological literature. They embraced a wide variety of subjects, including Experimental Physiology, (1855); The Effects of Poisonous Substances and Drugs (1857); The Physiology and Pathology of the Nervous System (1856); The Liquids of the Organism (1859); Experimental Pathology (1872); Anesthetics and Asphyxia (1875); and Operative Physiology, of which he himself was the consummate master. In his later life, he turned philosopher, and expounded his doctrines in, "An Introduction to Experimental Medicine" (1865), and "General Physiology" (1872). In the former book he dwells at some length on the psychological make-up of the ideal investigator, and the inductive and deductive processes whereby he may institute experiments or arrive at conclusions. He stresses the importance of investigating with an open mind, ever alert to observations other than those looked for or desired. He is himself an excellent example of the importance of this characteristic, since all of his really great discoveries represent chance observations, made while performing unrelated experiments.

Many present-day investigators would do well to take to heart these words of Claude Bernard:

> Put off your imagination as you put off your overcoat, when you enter the laboratory; but put it on again, as you do your overcoat, when leaving the laboratory. Before your experiment, and between whiles, let your imagination wrap you around; put it right away from you during the experiment itself, lest it hinder your observing power.[1]

This was his credo, and his works indicate that he followed it to the letter.

The novice and beginner in physiological research would profit immensely by reading his "Introduction to Experimental Medicine," enunciating as it does the ideal in experimental investigation, and inspiring with brief accounts of his own monumental labors. Even the lay mind can hardly fail to be charmed by the masterly presentation of his material and his many pregnant aphorisms.

To summarize the influence of Claude Bernard would be to liken it to a tremendous monument, the foundation stones of which would represent many major researches on pancreatic digestion, glycogen, vasomotor nerves, and toxicological studies; and resting upon these, layer on layer, would be stones representing later investigations of other workers, directly dependent upon these fundamental studies of Claude Bernard. These would include phases of digestion, absorption, metabolism, muscular contraction, explanations of inflammation and hypertension, muscle irritability and oxygen conduction in the blood, and many others. And in turn would be other stones resting on these, representing investigations using these observations as fundamental, and so on, ad infinitum. It can thus be seen what a tremendous structure such a monument would be. And when we remember that it all rests on the few major researches of Claude Bernard, we can realize the deplorable incompetence of any attempt to thoroughly trace out the diversified observations directly and indirectly dependent upon these researches. It is of course manifestly obvious that a great many of these observations would have been made by subsequent workers, even had Claude Bernard never lived; but it is equally obvious that their discovery would have been considerably retarded, and in some instances, perhaps not yet brought to light.

This dissertation may seem to be exaggerated eulogy, or the product of hero worship; but when we stop to reflect upon the nature and far-reaching influence of Claude Bernard's work and personality, we quickly come to the conclusion that panegyrics and encomiums are insufficient tribute to so great a master.

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A CHECK LIST OF INCUNABULA CONTAINED IN THE BOSTON MEDICAL LIBRARY*

THIS check-list is primarily intended for the use of book-lovers and others who may desire to ascertain easily if certain books are in the collection and consequently the entries have been made as simple as possible so as not to be confusing to readers unacquainted with bibliographical description and terminology. The arrangement is alphabetical by authors, and titles where the books are anonymous. Where the incunabula have been previously described in a standard bibliography, a short conventional title has been used without quotations from the incipit, colophon or text. References are given to Hain, the Gesamtkatalog der Wiegendrucke, and other recognized authorities.

The form of entry embodies the author, short title, size of page in millimeters, place and date of publication, printer and references. The entries marked with an asterisk are contained in the William Norton Bullard collection. The books are being collected with the definite idea of bringing together the works on medicine and related subjects which were necessary to the medical student and scholar, an attempt to reconstruct an independent medical library of the late fifteenth century. The medieval student's greatest need was dictionaries to interpret the new words flowing into the language from foreign sources. The modern student of medieval literature must have contemporary dictionaries to define and interpret the unusual words he finds in the medieval texts. For these reasons the Bullard collection contains a fine collection of dictionaries. The Arabian authors are very well represented, and the collection is also strong in the philosophical field of medicine. There is a good selection of works on witchcraft, demonology, sorcery and divination, and on the pest.

Particular attention is called to the "Opus de Universo" of Rabanus Maurus, 1467, the first recorded printed book to contain a chapter on medicine; the "Guldin Harpffen" of Johannes Nider, printed by Bämler at Augsburg in 1472 (a magnificent copy, superbly illuminated in gold and colors); the two early texts of Bagellardus and Metlinger on pediatrics; the "Regimen" of Maimonides, from the Monastery of SS. Ulrich and Afra; the very fine copy of the 1481 "Catholicon" of Johannes Balbus; the first impression of the first edition of the "Buch der Chirurgia" of Hieronymus Brunschwig, with the first printing of the added "Anathomia," in immaculate condition; the surgical collections of Guy de Chauliac and Petrus de Argellata; the first edition of the "Versehung von Leib, Seele, Ehre und Gut" from the Monastery of Saint Peter at Salzburg; the graphic incunabula of Brunschwig, Johannes de Ketham, Petrus de Abano and Peyligk; the fine copy of the Mainz "Gart der Gesundheit"; the Toledo Gutierrez; the first edition of the "Fasiculus medicine" of Ketham (the only copy in an English-speaking country); the extremely scarce "Aderlassbüchlein" and other vernacular tracts, and the two very fine Garlandia dictionaries.

The total number of incunabula here listed is 257 representing 237 separate works. JAMES F. BALLARD.

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* Compiled by James F. Ballard, Director.

*Aderlassbüchlein.
205 × 140 mm. 8 f. [Alost, Johann von Paderborn and Thierry Martens, *ca.* 1473–74].
Hain 86, G.W.220.
One of three recorded copies.

*Adjuratio. F 1a Adiuratio immu/dorum spirituum humana corpora torquentiū omnis/sane superstitionis expers. Ea nempe est qua Rome in/Basilica diui Petri ad malignos spiritus ex obsessis/corporibus propellendos exorciste vtuntur. [Woodcut of Bishop seated before lectern with open book.] F 8b [The end]...In nomine domine nostri iesu chri/sti: Amen/Finis.
137 × 95 mm. 8 f. Sig.a.8. Gothic types (74 mm. = 28 lines). Running title "Jesus Maria." Without place, printer or date. [Paris, end of 15th century.]
Unrecorded.

*ALBERTI, JOHANNES MICHAEL. De omnibus ingeniis augendae memoriae libellus.
201 × 147 mm. 12 f. Bologna, Franciscus dictue Plato de Benedictis, 24 Jan. 1491.
Hain 426, G.W.570.

*ALBERTUS MAGNUS. De generatione et corruptione.
317 × 216 mm. 24 f. Venice, Johannes et Gregorius de Gregoriis, 10 June, 1495.
Hain 517, G.W.613.
Bound with: Albertus Magnus, Metaphysica, Venice, 1494, Hain 501.

*ALBERTUS MAGNUS. Liber aggregationis. With: De mirabilibus mundi.
208 × 144 mm. 30 f. [Rome, Stephan Plannck, not before 1480.]
Pell 346, G.W.632.

*ALBERTUS MAGNUS. Metaphysica.
317 × 216 mm. 150 f. Venice, Johannes et Gregorius de Gregoriis, 18 Dec. 1494.
Hain 501, G.W.683.

ALBERTUS MAGNUS. Philosophia pauperum. Containing: Aegidius Columna, "De regimen principum." Also: Albertus Magnus, De virtute intellectiva.
193 × 146 mm. 50 f. Brescia, Baptista de Farfengo, 13 June, 1493.
Hain 505, G.W.712.

*ALBERTUS MAGNUS. Physica.
317 × 216 mm. 128 f. Venice, Johannes et Gregorius, de Gregoriis, 31 Jan. 1494–95.
Hain 518, G.W.717.
Bound with: Albertus Magnus, Metaphysica, Venice, 1494.

*ALBERTUS DE SAXONIA. Quaestiones in Aristoteles libros de caelo et mundo. Edited by Hieronymus Surianus.
312 × 212 mm. 51 f. Venice, Otinus de Luna, 5 Ides [9] June, 1497.
Hain 577, G.W.797.

*ALBERTUS MAGNUS. Secreta mulierum et virorum cum commento.
190 × 138 mm. 34 f. [Augsburg, Johann Schönsperger, not before 1494].
H-C-577, G.W.733.

ALBERTUS MAGNUS. Secreta mulierum et virorum cum expositione Henrici de Saxonia.
206 × 143 mm. 56 f. Rome, [Unassigned], 8 Nov. 1499.
B.M. Cat. IV, 145, G.W.766, Reichling V, 1439.

*ALBERTUS MAGNUS. Summa de creaturis.
316 × 213 mm. 198 f. Venice, Simon de Luere, 19 Dec. 1498 and 16 Feb. 1498–99.
Hain 569, G.W.779.

*ALBUCASIS [Abū' l-Qāsim uz-Zahrāwi]. Liber servitoris de praeparatione medicinarum simplicium. Translated by Abraham Tortuosiensis. Edited by Simon a Cordo.
378 × 280 mm. 23 f. Pavia, [Antonius de Carchano for] Francesca de Sancto Petri, 23 Dec. 1478.
Osler 160.

*ALCHABITIUS. Libellus isagogicus de planetarum.... Translated into Latin by Johannes Hispalensis. Containing: Johannes de Saxonia, In Alchabitium. Corrected by Bartholomaeus alten.
195 × 146 mm. 98 f. Venice, Erhard Ratdolt, 1485.
Hain 617, G.W844.

*ALEXANDER BENEDICTUS. Collectiones medicinae.
210 × 146 mm. 8 f. [Venice, Johannes et Gregorius de Gregoriis, ca. 1493.]
Hain 806, Pell 455, B.M.Cat.v, 344, G.W.862.
Bound in a fragment of a 14th century manuscript on vellum.

ALEXANDER BENEDICTUS. De observatione in pestilencia (De febribus liber quintus).
204 × 150 mm. 28 f. (last blank), Venice, Johannes et Gregorius de Gregoriis, 4 Kal. Aug. [29 July] 1493.
Hain 807, Pell 456, G.W. 864.

*ANDREAE, ANTONIUS. Quaestiones de tribus principiis rerum naturalium. With: Formalitates. Containing: Thomas de Aquino, De ente et essentia. Edited by Thomas Penket.
305 × 205 mm. 66 f. Padua, Laurentius Canozius, 1475.
Hain 990. G.W.1667. Not in Osler.

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G.W.1666.

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147 × 101 mm. 182 f. Venice, Petrus de Quarengis, 15 Feb. 1499.
Hain 1206, G.W.2138.

*ANTONIO DA SIENA. De divina praeordinatione vitae et mortis humanae.
(211 × 140 mm. 56 f. [Rome, Eucharius Silber *ca.* 1480].
G.W.2206.

*Apicius. De re coquinaria. Containing: Suetonius Tranquillus. Caius, De claris grammaticis et rhetoribus.
198 × 140 mm. 40 f. Venice, Bernardinus de Vitalibus, [*ca.*1500].
Hain 1282, Cop.5671, G.W.2268, B.M.Cat.v, 550.

*Apuleius [pseud]. Herbarium.
208 × 148 mm. 108 f. [Rome, Johannes Philippus de Lignamine, *ca.*1483–84].
Hain 1322, G.W.2300, L'Art Ancien 1.
Imperfect. Leaves 98–108 missing. Leaf 60 torn with loss of one-third of text.

*Arculanus, Johannes; Arcolano, Giovanni. Expositio in priman fen quarti canonis Avicennae. With additions by Arnulphus de Sacra Saxa.
302 × 206 mm. 148 f. Venice, Bonetus Locatellus, 6 Kal. Nov. [27 Oct.], 1496.
Hain 1553, G.W.2317.

*Ardoino, Sante. De venenis. Edited by Dominicus de Canali.
431 × 285 mm. 106 f. Venice, Bernardinus Rizus, 19 July, 1492.
H-C. 1554, G.W.2318.

*Aristoteles. De animalibus: or De historia animalium. Containing: De natura animalium; De partibus animalium; De generatione animalium. Translated by Theodore Gaza. Edited by Sebastianus Manilius.
312 × 212 mm. 112 f. Venice, Johannes et Gregorius de Gregoriis, 14 Kal. Dec. [18 Nov.] 1492.
H-C. 1700, G.W.2351.
F 7a Woodcut border. Illuminated in gold.

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315 × 204 mm. 68 f. Venice, Otinus de Luna, 12 Kal. Nov. [21 Oct.] 1497.
Hain 1802, G.W.2529.

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Hain 1804a, Osler 86, G.W.2525.

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Cop. 650, G.W.2536.

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Hain 1871, G.W.2681.
F1 (title) missing. Large majescules illuminated in gold. The "Articella" is a collection of classical texts on medicine.

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Fine unpressed copy.

*Augustinus, Saint Aurelius. De civitate Dei. With commentary of Thomas Waleys and Nicolaus Trivet.
302 × 203 mm. 268 f. Basel, Johann Amerbach, Ides [13] Feb., 1490.
H-C.2066, G.W.2888.

*Augustinus, Saint Aurelius. De trinitate.
302 × 203 mm. 86 f. [Basel], Johann Amerbach, 1490.
H-C.2039, G.W.2928.
Bound with: Augustinus, Saint Aurelius. De civitate Dei, Basel, 1490.

*Augustinus, Saint Aurelius. Opuscula.
245 × 178 mm. 340 f. Venice, Dionysius Bertochus, 26 Mar. 1491.
Hain 1949, Pell 1461.
Imperfect. Have folios 225–340.

*Augustinus, Saint Aurelius. Opuscula.
274 × 161 mm. 272 f. Strassburg, Martin Flach, 11 Aug. 1491.
Hain 1950, G.W.2868.

Aguustinus, Saint Aurelius. Sermones ad heremitas.
127 × 90 mm. 172 f. Brescia, Jacobus Britannicus, 5 Jan. 1486.
H-C 2001, G.W. 3001.

*Augustis, Quiricus de. Lumen apothecariorum cum certis expositionibus.
316 × 214 mm. 38 f. Venice, Otinus de Luna, Papiensis, 19 Kal. Sept. [14 Aug.] 1497.
Hain 2122, Pell 1598.

Avenzohar or Abhomeron [Abū Marwān 'Abd-al Malik Ibn Zuhr]. Theicrisi...[Tajsīr fi 'l-mudāwāt wa 't-tadbīr]. With: Antidotarium, [Gâmi']. After the version of Jacobus

Hebraeus. Translated by Paravicius. Containing: Averroes, Colliget [Kullija].
315 × 208 mm. 108 f. Venice, Johannes et Gregorius de Gregoriis, 4 Jan. 1490–91.
Hain 2186, G.W.3103.

*AVENZOHAR OR ABHOMERON. Theicrisi... With: Antidotarium, [Gâmi']. After the version of Jacobus Hebraeus. Translated by Paravicius. Containing: Averroes, Colliget [Kullija]. Edited by Hieronymus Surianus.
305 × 209 mm. 108 f. Venice, Bonetus Locatellus, 31 May, 1496.
Hain 2187, G.W.3104.

*AVERROES [Abū'l Walid Muhammad Ibn-Ahmad Ibn-Muhammad Ibn-Rušd]. Colliget [Kullija].
286 × 266 mm. 116 f. Venice, Laurentius de Rubeis et socii, 5 Oct. 1482.
H-C.2189, Pell 1655, G.W.3107.
Rubricated. Initials painted in red. Copious marginal notes in an early hand.

*Avicenna [Abū 'Ali Husain Ibn- 'Abdallāh Ibn-Sīnā]. Canonis libri v, translated by Gerardo Cremonenis and De viribus cordis, translated by Arnoldus de Villa Nova.
232 × 170 mm. 500 f. Venice, Petrus Maufer et socii, 10 June, 1486.
Hain 2205, B.M.Cat.v,298.

AVICENNA. Canonis libri v....
250 × 177 mm. 442 f. Venice, Octavianus Scotus, 24 Mar. 1490.
H-C,2206, G.W.3122.
From the Library of Oliver Wendell Holmes.

*AVICENNA. Canonis libri I, III, IV, fen I, with commentary of Jacobus de Partibus. Edited by Jacques Ponceau.
417 × 294 mm. 452; 380; 358; 142 f. Lyon, Jean Trechsel, finished by Johann Clein, 9 Kal. Jan. [24 Dec.] 1498.
Hain 2214, Pell 1668, G.W.3127.
Libro I wanting.

*AVICENNA. Metaphysica. Edited by Franciscus de Macerata and Antonius Fracantianus.
297 × 204 mm. 42 f. Venice, Bernardinus de Vitalibus for Hieronymus de Duranlibus, 26 Mar. 1495.
G.W.3130.
Pierre Duhem copy.

BAGELLARDUS A FLUMINE, PAULUS. De infantium aegritudinibus et remediis.
200 × 145 mm. 23 f. [Padua], [Matthaeus Cerdonis], 10 Nov. 1487.
Hain 2245, G.W.3167.

*BALBUS, JOHANNES. Catholicon.
401 × 275 mm. 394 f. Strassburg, printer of the 1483 Jordanus de Quedlinburg, not after 1483, [ca.1481].
H-C.2252, G.W.3186.
The correct collation of this edition is 394 leaves, the first and last blank.
A very find complete copy in a contemporary German binding of stamped calf over wooden boards.

*BAPTISTA DE SALIS OR TROVAMALA. Summa casuum conscientiae. [Rosella]. Containing: Sixtus IV, Bull, Rome, 30 Dec. 1479.
169 × 112 mm. 568 f. Venice, Georgius Arrivabene, 5 Ides [9] Sept. 1495.
Hain 14183, G.W.3325.

BAPTISTA MANTUANUS, SPAGNUOLI. De patientia.
190 × 129 mm. 136 f. Venice, Jacobus Pentius de Leucho, 6 Sept. 1499.
Hain 2408, Pell 1812, G.W.3308.

BAPTISTA MANTUANUS, SPAGNUOLI. In Robertum Severinatem panegyricum carmen. Sominium Romanum. Epigrammata ad Falconem.
187 × 127 mm. 50 f. Venice, Jacobus Pentius, 6 Aug. 1499.
Hain 2396, G.W.3260.

BAPTISTA MANTUANUS, SPAGNUOLI. Parthenice secunda sive Catharinaria.
188 × 127 mm. 44 f. Venice, Jacobus Pentius, 14 July, 1499.
H-C.2375, G.W.3302.

*BARBARUS, HERMOLAUS. Castigationes Plinianae.
309 × 208 mm. 160 f. [Venice, Printer of the Hermolaus Barbarus: Castigationes Plinianae, (Hain 2420) at the request and expense of Daniel Barbarus, 1493–94].
H-C.2420, G.W.3341.

*BARTHOLOMAEUS ANGLICUS. De proprietatibus rerum.
286 × 194 mm. 266 f. Nuremberg, Anton Koberger, 3 Kal. June [30 May] 1483.
Hain 2505, Pell 1872, G.W.3409.

BARTHOLOMAEUS ANGLICUS. De proprietatibus rerum.
275 × 181 mm. 326 f. [Heidelberg, Printer of the Lindelbach (Heinrich Knoblochtzer)], 12 Kal. June (21 May), 1488.
G.W.3411.
Fine contemporary binding of stamped leather over boards.

BARTHOLOMAEUS ANGLICUS. De proprietatibus rerum.
277 × 192 mm. 257 f. Strassburg, Printer of the 1483 Jordanus de Quedlinburg, [11 Aug.] 1491.
Hain 2509, B.M.Cat.I, 142, G.W.3412.

*BAVERIIS. BAVERIUS DE. Consilia medica.
308 × 208 mm. 162 f. Bologna, Franciscus dictus Plato de Benedictis, 5 Nov. 1489.
H-C.2712, Pell 2010, G.W.3739.

*BELLANTIUS, LUCIUS. De astrologica veritate. Containing: Responsiones in Disputationes Johannis Pici adversus astrologicam veritatem.
274 × 205 mm. 128 f. Florence, Gherardus de Harlem, 9 May, 1498.
Hain 2758, Pell 2027, G.W.3802.

*BENEDICTUS DE NURSIA. De conservatione sanitatis.

204 × 147 mm. 62 f. [Rome, Stephan Plannck, *ca.* 1485].
Cop.4444, G.W.3820.

*[BERENGARIUS de Londora, archiep. Compostellanus O.Pr.] Lumen anime: liber moralitatum.

262 × 200 mm. 370 f. [Augsburg] Anton Sorg, 3 Sept. 1477.
B.M.Cat.II, 344. Not in Osler.
Matthaeus Farinator was not the author as commonly supposed, but only the editor and added two registers.

BERNARDUS DE GORDONIO. Practica dicta lilium medicinae.

255 × 165 mm. 204 f. Lyons, Anthonius Lambillionis and Marinus Sarracenus, 2 May, 1491.
Hain 7797.

*BERNARDUS DE GORDONIO. Practica dicta lilium medicinae.

201 × 148 mm. 276 f. Venice, Johannes et Gregorius de Gregoriis, 16 Jan. 1496–97.
Hain 7797, B.M.Cat.v, 349.

*BEROALDUS, PHILIPPUS, of Bologna. Annotationes centum. . . .

307 × 211 mm. 112 f. Brescia, Bernardinus Misinta [26 Dec.] 1496.
Hain 2946, Pell 2209.

*BEROALDUS, PHILIPPUS. De felicitate opusculum.

214 × 181 mm. 28 f. Bologna, Benedictus Hectoris, Ides [13] April 1499.
Hain 2971, Pell 2225.

*BEROALDUS, PHILIPPUS. Orationes et poemata.

197 × 136 mm. 76 f. Paris, Denis Roce, 12 Oct. 1499.
Hain 2954, Pell 2213.
Warenghein copy.

*BOETHIUS, ANICIUS MANLIUS TORQUATUS SEVERINUS. De consolatione philosophia. De disciplina scholarium. With commentary of Thomas de Aquino.

302 × 209 mm. 102 f. Venice, Bonetus Locatellus, 18 Kal. July [14 June] 1498.
Hain 3407, B.M.Cat.v, 450.

*BONAVENTURA, SAINT; GIOVANNI DA FIDANZA. De castitate et munditia sacerdotum-

179 × 130 mm. 34 f. Leipzig, Conrad Kachelofen, 1498.
Hain 11641, B.M.Cat.III, 628.

*BONVICINUS DE RIPA. Vita scholastica.

204 × 152 mm. 20 f. Venice, Theodorus de Ragazonibus, 7 Aug. 1495.
Hain 3656, B.M.Cat.v, 478.
F.1, title missing.
Redgrave copy.

*BRUNSCHWIG, HIERONYMUS. Das Buch der Chirurgia.

269 × 196 mm. 126 f. + 6 f. of the Anathomia. Strassburg, Johann [Reinhard] Grüninger, Zinstag nach s. Peter und Paulsdag [4 July], MCCCCXCVII [1497].
Hain 4018, Pell 3041.
The first impression of the first edition with the first printing of the added "Anathomia" as described by Sudhoff, Arch. f. d. Gesch. d. Med., Lpz. 1907–08, 1, 41.

*BRUNSCHWIG, HIERONYMUS. Das Buch der Pestilentz.

284 × 200 mm. 40 f. Strassburg, Johann [Reinhard] Grüninger, Mitwock nach unser Lieben Frowen Hymelfart [19 Aug.] 1500.
Hain 4021, Sudhoff 205.
Woodcut illustrations. Contemporary binding.

*BRUTUS, JACOBUS. Corona aurea, de laudibus litterarum.

201 × 149 mm. 208 f. Venice, Johannes Tacuinus, 14 Jan. 1496–97.
Hain 4026, B.M.Cat.v, 531.

CANDIDUS Decembrius, PETRUS. De genitura hominis.

210 × 150 mm. 8 f. Without place, date or printer.
Hain 4314.

*CAPELLUTIUS, ROLANDUS. Tractatus de curatione pestiferorum.

208 × 142 mm. 6 f. Rome, Without date [Stephan Plannck].
Hain 4375, B.M.Cat.IV, 89, Klebs 38.

CELSUS, CORNELIUS. De medicina.

292 × 209 mm. Florence, Nicolaus [Laurentiis], 1478.
Hain 4835.
Tall copy. Margins 75 & 79 mm. Table of contents missing and supplied in old mss.

CELSUS, CORNELIUS. De medicina.

301 × 206 mm. 62 f. Venice, Johannes Rubeus, 8 July, 1493.
H-C. 4837.

*CELSUS. De medicina.

290 × 210 mm. 94 f. Venice, Philippus Pincius, 6 May, 1497.
Hain 4838.

*CENSORINUS. De die natali. Edited by Philippus Beroaldus.

293 × 193 mm. 38 f. Bologna, Benedictus Hectoris Faelli, 4 Ides [12] May, 1497.
Hain 4847.

*CERMISONUS, ANTONIUS. Consilia. [With other medical tracts].

306 × 210 mm. 94 f. Venice, [Bonetus Locatellus, *ca.* 1497].
Hain 4884.

*CHAIMIS, BARTHOLOMAEUS DE. Interrogatorium sive confessionale.

268 × 182 mm. 137 f. [Strassburg, Printer of the Henricus Ariminensis, *ca.* 1475].
Hain 2478.

*CHERUBINI DA SPOLETO. Regola della vita spirituale e matrimoniale.

190 × 130 mm. 80 f. [Florence, Bartholomeo de Libri? *ca.* 1486].
Cop.II, 1584.

*Chiromanthia.

200 × 143 mm. 24 f. Venice, Bernardinus Benalius, Oct. 1493.
Hain 4976.
Contains 21 full page wood-cut diagrams of hands.

*COLLENUÇIUS, PANDULPHUS. Plinii defensio adversus Nicolai Leoniceni accusationem.

207 × 148 mm. 52 f. Ferrara, Andreas Belfortis.
Hain 5483.

*CONCOREGIO, JOHANNES DE. Opus de aegritudinibus particularibus. Edited by Johannes de Romagnano and Lazaro Dataro Placentinus.

265 × 197 mm. 122 + 66 f. Pavia, Antonius de Carchano, 1485.
H-C.5615, Pell 3915.

*Conjuratio malignorum spirituum in corporibus hominum existentium prout in sancto Petro.

129 × 96 mm. 8 f. [*ca.* 1500].

*CRASTONUS OR CRESTONUS, JOHANNES. Lexicon graeco-latinum.

200 × 149 mm. 116 f. Reggio nell 'Emilia, Dionysius Bertochus and Marcus Antonius de Bazaleriis, 1497.
Hain 5817, Pell 4041.

*CRASTONUS OR CRESTONUS, JOHANNES. Lexicon graeco-latinum.

319 × 207 mm. 294 f. Modena, Dionysius Bertochus, 13 Kal. Nov. [20 Oct.]; 3 non [5] July 1500.
Hain 5814, Pell 4043.

*CYRILLUS, SAINT. Speculum sapientiae, alias apologeticus.

271 × 200 mm. 61 f. [Basel, Michael Wenssler, *ca.* 1475].
Hain 5903, Pell 4048.

*DINUS DE GARBO. Expositio super Avicenne. De ponderibus et compilatio emplastorum; Gentilis de Fulgineo de lepra e Gentilis de Florentia de fracturis.

280 × 203 mm. 164 f. Venice, Johann Hamman, 4 Dec. 1499.
Hain 6168.

*DIOGENES CYNICUS. Epistolae. Translated by Francisco Accolti (Francisco Aretino). Containing: Brutus, Marcus, Epistolae, and Hippocrates, Epistolae. Translated by Rinucio d'Arezzo.

220 × 143 mm. 54 f. Florence, Antonio di Francesco, [first press], 22 June, 1487.
Hain 6194, Pell 4272.
Binding 18th century Russian by Thouvenin.
Genuine first edition.

*DIOGENES LAERTIUS. Vitae et sententia philosophorum. Translated and edited by Ambrosius Travesarius and corrected by Benedictus Brognolus.

218 × 156 mm. 112 f. Venice, [Bonetus Locatellus], 15 Kal. Jan. [18 Dec.] 1490.
Hain 6202, Pell 4277.
Initials painted in gold and colors.

*DIOGENES LAERTIUS. Vitae et sententiae philosophorum. Translated by Ambrosius Traversari. Edited by Benedictus Prognolus.

311 × 209 mm. 96 f. Venice, Philippus Pincius, 22 June, 1497.
Hain 6205, Pell 4279, B.M.Cat.v, 498.

*DIONYSIUS DE LEUWIS, RIKEL. Carthuthusianus. Specula omnis status humanae vitae.

220 × 158 mm. 118 f. Nuremberg, Peter Wagner, 28 Jan. 1495.
Hain 6246, B.M.Cat.II, 465.

*DIOSCORIDES PEDACIUS ANAZARBENIS. πΣρὶ ὕλης ἰατcιχῆs [De materia medica] Nicander Colophonensis Tα Θηριαχχ́ χαlτα αλΣεiράρυχα [De theriaca et de alexiprhamaca]. Greek text.

306 × 224 mm. 184 f. Venice, Aldus Manutius, July, 1499.
Hain 6257, Pell 4338, B.M.Cat.v, 560.

DONDIS, JACOBUS DE. Aggregator Paduanus de medicinis simplicibus.

385 × 282 mm. 286 f. [Strassburg, R. printer, *ca.* 1470–1480.]
Hain 6395, Pell 4435, B.M.Cat.I, 64.

*Etymologicum. Tα τέγα ετνυολογcόχν [Edited by Marcus Musurus].

404 × 264 mm. 224 f. Venice, Zacharias Callierges, July, 1499.
Hain 6691, Pell 4629, B.M.Cat.v, 580.

*FAGIFACETUS. De moribus et facetiis mense. With commentary by Sebastian Brant.

208 × 141 mm. 20 f. Basel, Michael Furter, *ca.* 1490.
Pell 4729.

FALCUTIUS, NICOLAUS, Florentinus: NICCOLÓ FALCUCCI. Sermones medicinales septem.

7 pts. in 4 v. 410 × 275 mm. Venice, Bernardinus Stagninus, 1490–1491.
Hain 11768.
Pt. 3, f. 49–64 in facsimile.

*FESTUS, SEXTUS POMPEIUS. De verborum significatione.

294 × 204 mm. 66 f. [Venice, Printer of the "Pomponius Mela," *ca.* 1478.]
Hain 7041, B.M.Cat.v, 262.

FICINUS, MARSILIUS. Consiglio contro la pestilencia.

198 × 136 mm. 52 f. Florence, Jacobum de Ripoli, 1481.
Hain 7082, Reichling II, p. 169, Klebs 44.
Folio G1 missing.

FICINUS, MARSILIUS. De christiana religione.

203 × 148 mm. 84 f. Venice, Otinus de Luna, 1500.
Hain 7070, Pell 4789.

*FICINUS, MARSILIUS. De triplici vita.

280 × 211 mm. 91 f. Florence, Antonio Mischomini, 1489, 3 non. Dec. [3].
Hain 7065, Pell 4799.

FICINUS, MARSILIUS. De triplici vita.

204 × 140 mm. 100 f. Without place, printer or date. [Basel, Johann Amerbach, *ca.* 1498.]
H-C. 7063, B.M.Cat.III, 759.

*FICINUS, MARSILIUS. Epistolæ.

212 × 145 mm. 254 f. Nuremberg, Anton Koberger, 24 Feb. 1497.
Hain 7062.

Fiera, Baptista. Coena; de cibariorum virtutibus.
198 × 138 mm. 30 f. [Rome, Eucharius Silber, *ca.* 1484].
Hain 7084, Reichling II, 169.

*Firmicus Maternus, Julius. De nativitatibus. Edited by Antonius Laurus.
317 × 214 mm. 120 f. Venice, Simon Bevilaqua, 13 June, 1497.
Hain 7121^{bis} B.M.Cat.v, 522.
Beautiful xylographic title-page and on folio 5 a delicate woodcut border, one of the finest Italian borders.

*Gaietanus de Thienis; Tiene, Gaetano. Expositio in libros Aristotelis de coelo et mundo. Edited by Joannes Antonius Sicanus.
271 × 185 mm. 76 f. Venice, Otinus de Luna, 3 Oct 1498.
Hain 15501, B.M.Cat.v, 569.

*Galeottus Narniensis, Martius. Refutatio objectorum in librum a Georgio Merula.
231 × 182 mm. 104 f. Venice, Johannes Rubeus, 1476.
H-C.7434, B.M.Cat.v, 215.

*Gallensis, Johannes. Communiloquium; summa collationum.
295 × 209 mm. 206 f. Augsburg, Anton Sorg, 1475.
Hain 7442, B.M.Cat.vi, 342.

*Gandavo, Johannes de. Quaestiones super tres libros Aristoteles de anima.
310 × 210 mm. 95 f. Venice, Otinus de Luna, 4 non. March [4] 1497.
Hain 7463.

*Garlandia, Johannes de. Equivoca.
189 × 130 mm. 74 f. [Deventer, Richard Paffroed, *ca.* 1490].
Cop. 2636, Proctor 9027, Duff 153, Quaritch Cat. 431, 1930, No. 588.
Extremely rare and apparently the only perfect copy known of this edition (Quaritch).

*Garlandia, Johannes de. Synonyma with commentary of Galfridus Anglicus [Geoffrey of Monmouth].
189 × 133 mm. 64 f. Antwerp, Thierry Martens, 21 July, 1493.
Cop. 2630, Proctor 9451, Duff 159, Quaritch Cat. 431, 1930, No. 589.
Very rare. Duff records only two copies of this edition.

*Gart der Gesundheit.
278 × 193 mm. 356 f. [Mainz, Peter Schöffer], 28 Mar. 1485.
Hain 8948, B.M.Cat.I, 35, Sudhoff 67.
The first edition of the German Hortus sanitatis. Fine copy in contemporary binding. Colored.

*Gazius, Antonius. Corona florida medicinae; de conservatione sanitatis.
296 × 200 mm. 126 f. Venice, Johannes et Gregorius de Gregoriis, 20 June, 1491.
Hain 7501, Pell 5003, B.M.Cat.v, 341.

*Geminiano, Johannes Gorus, de Sancto. Liber de exemplis et similitudinibus rerum.
183 × 133 mm. 404 f. Venice, Johannes et Gregorius de Gregoriis, 10 Apr. 1497.
Hain 7545.

*Gentilis Fulginas. Questiones de febribus.
405 × 275 mm. 17 f. First blank, sig. a8, b6, c3. Without place, date or printer. [Siena 1485?].

*Gentilis Fulginas. Super prima fen quarti Canonis Avicennae.
420 × 284 mm. 72 f. Venice, Baptista de Tortis, 24 Jan. 1490.

Geroch, Vita. Prognosticon anni 1488.
194 × 139 mm. 8 f. Rome, Eucharius Silber, n.d.
Hain 7620.

Gerson, Johannes; Jean le Charlier de. De nocturna et diurna pollutionibus et de cognitione castitatis.
200 × 143 mm. 28 f. Cologne, Ludwig von Renchen, undated.
Hain *7701, Proctor 1275.
This copy has only the first 14 leaves.

*Gerson, Johannes. Opera.
Pt. 2, 235 × 168 mm. 289 f. [Nuremberg, Georg Stuchs], 5 non. Aug. [1], 1489.
H-C.7623.

*Gesta romanorum.
220 × 158 mm. 111 f. [Nuremberg], 4 March, 1494.
Hain 7748.
Bound with: Dionysius de Leuwis, Specula omnis . . . Nuremberg, 1495.

*Gradi or Gradibus, de Ferraris, Johannes Matthaeus de. Opera medica; Practica cum textu IX Rhasis ad Almansorem.
404 × 286 mm. 247 f. Pavia, Aloysius Comensis et Bartholomaeus de Trottis, 27 May, 1497.
Hain 7838.

*Guainerius, Antonius. Opera medica.
298 × 210 mm. 255 f. Pavia, Antonius de Carchano, 10 Jan. 1488.
Hain 8098.

*Guainerius, Antonius. De peste et de venenis.
284 × 198 mm. 43 f. Without place, printer or date.
Hain 8101.

*Guido de Cauliaco; Guy de Chauliac. Cyrurgia, [with other treatises].
316 × 215 mm. 268 f. Venice, Bonetus Locatellus, 11 Kal. Dec. [21 Nov.], 1498.
Hain 4811, B.M.Cat.v, 451.

*Gulielmus de Saliceto. De salute corporis; Turrecremata, Johannes de, De salute anima.
201 × 144 mm. 14 f. Leipzig, Arnoldus de Colonia, 1495.
Hain 14152, B.M.Cat.III, 644.

*Gulielmus de Saliceto. Summa conservationis et curationis; Opus in scientia medicinali; Chirurgia.
305 × 210 mm. 177 f. Venice, [Johannes et Gregorius de Gregoriis] 8 May, 1490.
Hain 14145.

Gutierrez, Juliano. Cura de la piedra y dolor de la yjada y colica rreñal.

285 × 191 mm. 88 f. Toledo, Pedro Hagenbach for Melchoir Gorricio, 4 April, 1498.
Hain 8336, Reichling ii, 185.

*Haly Abbas [Ali ibnu l-Abbās]. Liber medicinae dictus regalis. Translated by Stephanus. Edited by Antonius Vitalis.
431 × 288 mm. 192 f. Venice, Bernardinus Rizus, 25 Sept. 1492.
Hain 8350, B.M.Cat.v, 403.

Herbarius. Herbolarium de virtutibus herbarum.
203 × 145 mm. 150 f. Vicenza, Leonardus de Basilea, [Achates] et Gulielmus de Papia, 27 Oct. 1491.
Hain 8451.
Woodcut border with portraits of Arnoldus de Villa Nova and Avicenna. Uncolored.

*Hippocrates. De insomniis. Translated and edited by Andreas Brentius.
191 × 144 mm. 16 f. [Rome, Oliverius Servius, 1481].
Hain 3779, B.M.Cat.iv, 130.

*Hippocrates. De sententiae. With commentary by Galen. Edited by Laurentius Laurentianus.
280 × 205 mm. 97 f. Florence, Antonio Mischcomini, 17 Kal. Nov. 1494.
Hain 8672.

*Honestus, Christopherus Georgius de. Expositio super antidotario Mesue.
280 × 201 mm. 48 f. Ferrara, Andreas [Belfortis], 20 March, 1488.
Hain 8799.

Hugo Senensis. Expositio in libros tegni Galeni.
321 × 210 mm. 94 f. Venice, Bonetus Locatellus, 11 Kal. July [22 June], 1498.
Hain 9015, B.M.Cat.v, 450.

*Hugo Senensis. Super aphorismos Hippocratis et commentum Galeni.
300 × 210 mm. 190 f. Ferrara, 15 Nov. 1493.
Hain 9011.

Hugo Senensis. Super i et ii fen prima canonis Avicennae. Containing: Antonius Faventinus, De febre.
321 × 210 mm. 125 f. Venice, Bonetus Locatellus, 5 Kal. May, [27 Apr.], 1498.
Hain 9017.

*Hundt, Magnus. Introductorium in universalem Aristotelis physicam.
206 × 182 mm. 260 f. Leipzig, Wolfgang Stoeckel, 13 Kal. Aug. 1500.
Hain 9041.

*Iamblichus. De mysteriis...[With other treatises]. Translated by Marsilius Ficinus
291 × 193 mm. 186 f. Venice, Aldus Manutius, Sept. 1497.
Hain 9358, B.M.Cat.v, 557.

*Isidorus, Hispalensis. Liber etymologiarum. De summo bono.
295 × 206 mm. 100 f. Venice, Bonetus Locatellus 3 Ides Dec. [11], 1493.
Hain 9280, B.M.Cat.v, 442.

*Isidorus, Hispalensis. De responsio mundi et astrorum ordinatione.
307 × 209 mm. 20 f. Augsburg, Günther Zainer, 7 Dec. 1472.
Hain 9302, B.M.Cat.ii, 317.

*Jacobi, Johannes. Tractatus de pestilencia.
185 × 126 mm. 12 f. [Augsburg, Johann Keller, *ca.* 1480.]
Hain 12745, Proctor 1746, Klebs 62.

*Jacobus de Clusa. Carthusiensis. Tractatus peroptimus de animabus exutis a corporibus; de apparitionibus et receptaculis animarum. Edited by Jacobus de Paridisus.
211 × 145 mm. 18 f. [Nuremberg, Georg Stuchs, *ca.* 1490].
Hain 9345, B.M.Cat.ii, 471.

*Jacobus de Forlivio. De generatione embrioniis Avicēne. With commentary of Bernardinum Botontum de Viterbio.
405 × 272 mm. 18 f. Siena, Henricus de Colonia, Nons Mar. 1485.
Hain 7235.

*Jacobus de Forlivio. Expositiones in primum librum canonis Avicennae. Jacobus de Partibus, expositio super cap. infra scriptis a Jacobo forliviensi nō expositis. Containing: Hugo Senensis, Questiones de malitia complexionis diverse.
420 × 286 mm. Pavia, Aloysius Comensis and Bartholomaeus de Trottis, 17 Nov. 1500.

Johannes de Gaddesden. Rosa anglica practica medicinae.
285 × 200 mm. 177 f. Pavia, Johannes Antonius Birreta, 24 Jan. 1492.
Hain 1108.

Johannes de Ketham or Ketam. Fasciculus medicine. Revised by Georgius de Montessarats.
396 × 263 mm. 15 f. Venice, Johannes et Gregorius de Gregoriis, Venice, 26 July, 1491.
Hain 9774.
First edition. Only recorded copy in an English speaking country.

Josephus Flavius. Opera. Translation of Rufinus Aquileiensis. Edited by Hieronymus Squarzaficius.
289 × 200 mm. 278 f. Venice, Johannes Rubeus, 23 Oct. 1486.
Hain 9454, B.M.Cat.v, 415.

*Lactantius, Lucius Coelius, Firmianus. Opera; De divinis institutionibus. Edited by Joannes Andreae.
304 × 203 mm. 140 f. Venice, Simon Bevilaqua, 4 Apr. 1497.
Hain 9818, B.M.Cat.v, 522.

Leonicenus, Nicolaus. De morbo gallico.
200 × 150 mm. 28 f. Venice, Aldus Manutius.
Hain 10019.

*Lollius, Antonius. Oratio circumcisionis....

205 × 140 mm. 6 f. [Rome, Stephan Plannck], Kal. Jan. [1], 1485.
Hain 10179.

*MACER FLORIDUS [ODO OF MEUDON]. De viribus herbarum.
201 × 121 mm. 52 f. [Geneva, Louis Cruse, before 1500].
Klebs 63.
Uncolored.

MAGISTER, MARTINUS. Quaestiones morales. Vol. 2. De temperantia....
285 × 203 mm. 186 f. Paris, Wolfgang Hopyl, 10 Oct. 1490.
H-C. 10458.

*MAGNI, JACOBUS; Jacques le Grand. Sophologium.
187 × 206 mm. 168 f. [Cologne, Printer of Albertus Magnus, De virtutibus, *ca.* 1470].
Hain 10470, B.M.Cat.I, 236.

*MAGNINUS, Mediolanensis. Regimen sanitatis....[With other medical treatises].
189 × 134 mm. 128 f. Without date, place or printer.
Hain 10482, Proctor 8705.

*MAIMONIDES, MOSES. Aphorismi medici. Containing: Janus Damascenus [Mesue Senior] Aphorismi, and Rhazes, De secretis in medicina.
192 × 138 mm. 158 f. Bologna, Franciscus dictus Plato de Benedictis, 4 Kal. June [29 May], 1489.
Hain 10524.

*MAIMONIDES, MOSES. De regimen sanitatis ad Soldanum Babylonice.
209 × 142 mm. 40 f. Florence, apud S. Jacobum de Ripoli [1477].
H-C.10525.

*MAIUS, JUNIANUS. De priscorum proprietate verborum.
287 × 200 mm. 348 f. [Venice, Johannes Rubeus], 23 Feb. 1490.
H-C.10545, B.M.Cat.V, 416.

*MANFREDIS, HIERONYMUS DE. Liber de homine (Il Perchè).
269 × 185 mm. 110 f. Naples, [Francesco del Tuppo], 1478.
Hain 572, Osler 154.
Erroneously ascribed to Albertus Magnus.

*MANLIIS, JOHANNES JACOBUS, de Boscho. Luminare maius.
310 × 205 mm. 80 f. Venice, Bonetus Locatellus, 28 May, 1496.]
Hain 10712.

*Margarita decretalium. Edited by Sebastian Brant.
302 × 208 mm. 42 f. [Basel, Nicolaus Kesler, *ca.* 1492.]
H-C. 10755, B.M.Cat.III, 773.
The first of the two undated editions.

MATHEOLUS DE MATTHIOLIS, Perusinus. De memoria....
207 × 144 mm. 6 leaves unnumbered, without catchwords. [Augsburg, Johann Schaur, *ca.* 1494.]
Hain 10909, Proctor 1924, Schreiber 4595.

*MATTHAEUS DE LUCCA. De diebus creticis.
200 × 144 mm. 8 f. Rome, [Andreas Fritag], 1493.
B.M.Cat.IV, 136.

MELBER, JOHANNES. Vocabularius predicantium; Variloquus.
186 × 135 mm. 180 f. Strassburg, Martin Schott, *ca.* 1487.
Hain 11030.

*Mensa philosophica.
197 × 135 mm. 54 f. Cologne, apud predicatores [Zierikzee], undated.
Hain 11077.

*MERULA, GEORGIUS. In librum Galeotti Martii de homine.
230 × 167 mm. 80 f. Without place, date or printer.
Hain 11097, Proctor 4285.

MESUE, Junior [Maswijah al-Marindi] [Pseudo-Mesue]. Opera. [With additional treatises.]
307 × 210 mm. 372 f. Venice, Johannes et Gregorius de Gregoriis, 14 October, 1497.
Hain 11112, B.M.Cat.V, 350.
Initials illuminated in colors with floral designs.

*METLINGER, BARTHOLOMAEUS. Regiment der jungen Kinder.
298 × 205 mm. 25 f. Augsburg, Johann Bämler, 28 August, 1474.
Hain 11128, Sudhoff 36, Osler 49, L'Art Ancien, Bull. 15, pt. 3, 1193.

*MOLITORIS, ULRICUS. De lamiis et phitonicus mulieribus.
196 × 127 mm. 30 f. Basel, Michael Furter, *ca.* 1490.
Copinger 4337.
Seven full-page woodcuts, one repetition.

*MONTAGNANA, BARTHOLOMAEUS. Opera. Edited by Jacobus de Vitalibus.
321 × 207 mm. 396 f. Venice, Bonetus Locatellus, 4 non. Aug. [2], 1497.
Hain 11552, B.M.Cat.V, 448.

MUNDINUS; MONDINO DEI LUZZI. Anathomia.
203 × 150 mm. 24 f. Venice, Bernardinus de Vitalibus, 20 Feb. 1494.
Hain 11638, Reichling III, 117.

*MURNER, THOMAS. Tractatus de phitonico contractu.
196 × 150 mm. 12 f. [Strassburg, Mathias Hupfuff, *ca.* 1499].
H-C.11647, B.M.Cat.III, 692.
Formerly attributed to the anonymous press of "S Brandon's Leben" at Kirchheim, but now ascribed by Vouilliéme to the rare press of Mathias Hupfuff at Strassburg. Vouilliéme, Die Deutschen Drucker, p. 78.

*NESTOR, DIONYSIUS. Vocabularium.
308 × 214 mm. 186 f. Venice, Gulielmus Anima Mia, Tridinensis, 26 June, 1488.
Hain 6253, B.M.Cat.V, 410.

*NICEPHORUS. Logica. [With other tracts.] Translated by Georgius Valla.
333 × 221 mm. 156 f. Venice, Simon Bevilaqua, 30 Sept. 1498.
Hain 11748, B.M.Cat.V, 53.

Nicolaus de Auximo. Supplementum summae Pisanellae. Also contains: Consilia Alexandri de Nevo contra Judaeos foenerantes.
206 × 151 mm. 336 f. Venice, Bartholomaeus de Blavis, Andreas Toresanus de Asula and Maphaeus de Paterbonis, 10 Mar. 1481.
Hain 2161, B.M.Cat.v, 306.
First folio illustrated in gold. Red and blue initials throughout.

***Nider, Johannes.** Die vierundzweinczig Guldin Harpffen.
301 × 201 mm. 162 f. Augsburg, Johann Bämler, [18 Dec.] 1472.
Hain 11847.
B.M.Cat. attributes this work to Joannes Cassianus. The Huth copy, bound by Bedford. Magnificently illuminated in colors. All large initials are extended in floral designs to half and two-thirds the length of the page. Rubricated throughout. A museum specimen.

***Niger, Franciscus.** Modus epistolandi.
204 × 140 mm. 32 f. Venice, Matteo Capcasa, 3 non. Aug. (3 Aug.) 1492.
H-C.11867.

***Offredus, Apollinaris.** Expositio in primum posteriorum Aristotelis cum quaestionibus. Edited by Hieronymus Surianus.
270 × 187 mm. 96 f. Venice, Otinus de Luna, 19 Kal. Feb. [14 Jan.], 1497.
Hain 1285, B.M.Cat.v, 68.

*Opusculum repertorii Pronosticon in mutationes aeris tam via astrologica quam meteorologica. Containing: Hippocrates, Libellus de medicorum astrologia. Translated by Petrus de Abano.
229 × 150 mm. 50 f. Venice, Erhard Ratdolt, 1485.
Hain 13393, B.M.Cat.v, 291.

***Ortolff von Bayrlandt.** Artzneibuch.
283 × 182 mm. 85 f. Nuremberg, Anton Koberger, 17 Mar. 1477.
Hain 12112, B.M.Cat.II, 414.

***Ortolff von Bayrlandt.** Diss Biechlin sagt wir sich die schwangern Frawen....
189 × 136 mm. 8 f. Ulm, [Johannes Zainer, *ca.* 1495].
Hain 12117, Sudhoff 30.
Only three copies recorded, one of which is imperfect. Not in U. S. census.

***Pantheus, Johannes Antonius.** Annotationes de Thermis Caldarianis.
308 × 210 mm. 80 f. Venice, [Johann Hamman, 1500].
Hain 12376, H-C.12374, Reichling I, p. 174.

***Paulus Venetus.** Expositio in libros posteriores Aristotelis.
272 × 190 mm. 118 f. Venice, Gulielmus Anima Mia, Tridinensis, 11 Aug. 1486.
Hain 12512, B.M.Cat.v, 410.

***Paulus Venetus.** Expositio supra libros Aristotelis De generatione et corruptione. De compositione mundi. Edited by Jacobus Baptista Alouisius.
311 × 208 mm. 118 f. Venice, Bonetus Locatellus, 21 May, 1498.
Hain 12518, B.M.Cat.v, 450.
Lacks the De compositione mundi.

***Paulus Venetus.** Sophismata aurea. Corrected by Manfredus de Medici Mediolanensis.
290 × 205 mm. 103 f. Pavia, Nicolaus de Girardengis, 4 Mar. 1483.
Hain 12507.

Paulus Venetus. Super universalia Porphyrii et artem veterem Aristotelis expositio.
312 × 214 mm. 148 f. Venice, Bonetus Locatellus, Nones [7] Oct. 1494.
H-C.12520.
Copinger notes only 146 leaves, instead of 148.

***Petrarca, Franciscus.** De remediis utriusque fortunae.
196 × 143 mm. 246 f. [Heidelberg, Heinrich Knoblochtzer, 1485].
H-C.12791, B.M.Cat.III, 672.
Contemporary binding of stamped pigskin over wooden boards.

***Petrarca, Franciscus.** Opera.
270 × 195 mm. 389 f. Basel, Johann Amerbach, 1496.
Hain 12749, B.M.Cat.III, 757.

***Petrus de Abano** or Apono. Conciliator differentiarum philosophorum et praecipue medicorum.
285 × 200 mm. 293 f. Pavia, Gabriel de Grassis, 6 Nov. 1490.
Hain 3, Pell 3, Proctor 7096.

***Petrus de Abano** or Apono. Conciliator....
323 × 217 mm. 265 f. Venice, Bonetus Locatellus, Mar. 1496.
Hain 4.
On the reverse of folio 245 will be found the large woodcut of the abdominal muscles which places this edition in the class of graphic incunabula.

Petrus de Abano or Apono. Tractatus de venenis.
221 × 164 mm. 26 f. Mantue, 1473.
H-C.7, Pell 6.
George Dunn Copy.

***Petrus de Abano** or Apono. Tractatus de venenis.
240 × 140 mm. 18 f. Rome, [Stephan Planck], 17 Mar. 1490.
H-C.13, B.M.Cat.IV, 91, Proctor 3685.

***Petrus de Argellata.** Chirurgia.
319 × 214 mm. 132 f. Venice, Bonetus Locatellus, 8 Kal. Mar. [22 Feb.] 1497–98.
H-C-R.1637, G.W.2323.

***Petrus de Ciperia,** Lemovicensis. De morali oculo.
265 × 190 mm. 61 f. [Augsburg, Anton Sorg, *ca.* 1477].
H-C.9427, B.M.Cat.II, 345.

***Petrus de Palude.** In quatrum sententiarum. Edited by Paulus Soncinas.
312 × 209 mm. 248 f. Venice, Bonetus Locatellus, 12 Kal. Oct. [20 Sept.] 1493.
Hain 12286.

*Petrus Hispanus; Pope John xxi. Tesoro de poveri. Translated by Zucchero Bencivenni.
210 × 140 mm. 68 f. Venice, [Johannes Rubeus, Vercellensis] 2 Nov. 1500.
Hain 8716, Reichling v, 144.

*Peylick, Johannes. Philosophia naturalis compendium.
268 × 193 mm. 98 f. Leipzig, Melchior Lotter, 12 Sept. 1499.
Hain 12861, B.M.Cat.iii, 650.
An important graphic incunabulum. Folios Q 1–6 contain the "Anathomia" which is illustrated with one full page anatomical woodcut and ten small woodcuts in the text.

*Picus Mirandulanus, Johannes; Pico della Mirandola, Giovanni, Opera philosophica.
305 × 204 mm. 262 f. Venice, Bernardinus de Vitalibus, 14 Aug.; 9 Oct. 1498.
Hain 12993, B.M.Cat.v, 548.

*Pintor, Petrus. Aggregator sententiarum de praeservatione et curatione pestilentiae.
286 × 205 mm. 92 f. Rome, Eucharius Silber, 20 Feb. 1499.
Hain 13009.
Beautiful Cambridge binding of about 1530.
Fly leaves are taken from an early 16th century manuscript.

Platea, Franciscus de. Opus restitutionum, usurarum et excommunicationum.
205 × 146 mm. 226 f. Venice, Bartolomeo da Cremona, 1742.
H-C.13035.
Folio 1 of Table missing.

*Platina, Bartholomaeus; Bartolomeo de Sacchi. De honesta voluptate et valitudine.
212 × 150 mm. 95 f. Bologna, Franciscus dictus Plato de Benedictis, 11 May, 1499.
Hain 13056.

Plinius Secundus, Caius; Pliny the Elder. Historia naturalis.
317 × 290 mm. 268 f. Parma, Andreas Portilia, 8 Ides [8] July, 1481.
H-C.13094.

Plinius Secondus, Caius; Pliny the Elder. Historia naturalis.
307 × 208 mm. Venice, Rainaldus de Novimagio, 1483, 6 June.
Hain 13095.
Bound in polished calf by Maltby of Oxford.

Plinius Secundus, Caius Caecilius; Pliny the Younger. Epistolae.
185 × 138 mm. 91 f. Treviso, Johannes Rubeus, Vercellensis, 1483. H-C. 13113.

*Poggius, Johannes Franciscus. Facetiae.
200 × 144 mm. 60 f. Venice, Otinus de Luna, 1 Dec. 1500.
Hain 11399, B.M.Cat.v, 570.

*Rabanus Maurus, Magentius. Opus de universo; De sermonum proprietate.
399 × 282 mm. 168 f. [Strassburg, R. printer (Adolf Rusch), before July 20, 1467].
Hain 13669, B.M.Cat.i, 60, Osler 1.
Tall fine copy.

*Radulphis, Riccardus. Defensorium curatorum.
192 × 134 mm. 28 f. Without place, date or printer, [*ca.* 1480].
H-C.13672.
Huth copy, bound by Bedford.

*Raymundus de Sabunde or Sabundis. Theologia naturalis sive liber creaturarum.
245 × 168 mm. 274 f. [Lyon, Johann Siber].
H-C.14066.

*Raymundus de Sabunde or Sabundis. Theologia naturalis sive liber creaturarum.
267 × 199 mm. 162 f. Strassburg, Martin Flach, 21 Jan. 1496.
Hain 14069, B.M.Cat.i, 154.

Regimen sanitatis Salernitanum [Commentary by Arnoldus de Villa Nova].
210 × 155 mm. 82 f. Without place, date or printer, [Venice, Bernardinus de Vitalibus, 1500?]
Cop.5052.

Regimen sanitatis....
215 × 156 mm. 64 f. "Strassburg, 1491, in die S. Thome Cantuariensis" [29 Dec.].
Hain 13757.

*Regimen sanitatis....
207 × 141 mm. 80 f. Strassburg, 1491, in die S. Thome Cantuariensis, 29 Dec.
Hain 13758.

*Regius, Raphael. Epistolae Plinii; qua libri naturalis historiae... [With other tracts].
201 × 153 mm. 38 f. Venice, Gulielmus Anima Mia, Tridinensis, 10 Kal. June [23 May], 1490.
Hain 13810, B.M.Cat.v, 411.

*Reuchlin, Johann. Vocabularius Breviloquus.
313 × 213 mm. 330 f. Basel, [Johann Amerbach], 1478.
Cop.1285, B.M.Cat.iii, 745.
Stamped binding of full pig-skin over wooden boards.

Rhazes [Abū Bekr Muhammad ibn Zakariyā ar-Rāzī]. Liber ad Almansorem. [With other medical tracts[.
305 × 203 mm. 160 f. Venice, Bonetus Locatellus, 7 Oct. 1497.
Hain 13893, B.M.Cat.v, 448.

*Rhazes. Liber ad Almansorem, with commentary of Sillanus de Nigris. Containing: Petrus de Tussignanus, Receptae supra nonum ad Almansorem.
298 × 207 mm. 90 f. Venice, Otinus de Luna, 12 Kal. Aug. [21 July], 1497.
Hain 13897, B.M.Cat.v, 569.

*Robertus Linconiensis. Summa super libris physicorum Aristotelis. Expositio Sancti Thome super libros physicorum Aristotelis. Edited by Theophilus Cremonensis.
319 × 215 mm. 116 f. Venice, Petrus de Quarengis, Bergomensis, 22 April, 1500.
Hain 10110, B.M.Cat.v, 514.

*Rodericus Sanctius de Arevalo, Zamorensis. Speculum vitae humanae.
262 × 202 mm. 108 f. Basel, 1475.
Hain 13944.

Saladinus, de Esculo or Ascolo. Compendium aromatariorum.
302 × 200 mm. 30 f. Bologna, [Hendrik de Haarlem] for Benedictis Hectoris [Faelli], 12 Mar. 1488.
H-C.14131.
First edition.

*Savonarola, Giovanni Michele. Canonica de Febribus.
298 × 206 mm. 122 f. Bologna, Dionysius Bertochus, 8 Mar. 1487.
Hain 14487.

*Savonarola, Giovanni Michele. Canonica de febribus; de pulsibus; de urinis; de egestionibus; de vermibus.
314 × 211 mm. 142 f. Venice, Bonetus Locatellus, 10 Kal. Dec. [22 Nov.] 1498.
Hain 14489, B.M.Cat.v, 451.

Savonarola, Giovanni Michele. De balneis et terminis naturalibus omnibus Italie.
302 × 206 mm. 39 f. Ferrara, Andreas Belfortis, 10 Nov. 1485.
Hain 14493.

Savonarola, Giovanni Michele. De balneis et terminis naturalibus omnibus Italie.
318 × 213 mm. 35 f. Venice, Christoforus de Pensis, 20 Nov. [1496].
Hain 14492.

Savonarola, Giovanni Michele. Opus medicinae, practica de aegritudinibus de capite usque ad pedea.
314 × 201 mm. 278 f. Venice, Bonetus Locatellus, 5 Kal. July [27 June], 1497.
Hain *14484.
In contemporary binding, oak sides, vellum back, with clasps intact. Many illuminated initials.

Savonarola, Giovanni Michele. Summa de pulsibus, urinis et egestionibus.
309 × 209 mm. 44 f. Venice, Christoforus de Pensis, 10 Feb. 1497.
Hain 14491.

*Scotus, Michael. De procreatione et hominis phisionomia.
188 × 135 mm. 42 f. Without place, date or printer.
Hain 14544.
Knolls copy.

Scriptores astronomici veteres.
Pt. 1, 294 × 203 mm. 184 f. Venice, Aldus Manutius, June, 1499.
Hain 14559.

*Scriptores rei rusticae. With commentary by Philippus Beroaldus.
301 × 204 mm. 244 f. Reggio d'Emilia, Franciscus de Mazalibus, 20 Nov. 1499.
H-C.14570.

Seneca, Lucius Annaeus. Opera philosophica et epistolae. Containing: Seneca, Marcus Annaeus, Suasoriae et controversiae.
285 × 200 mm. 210 f. Venice, Bernardinus de Choris, 31 October, 1492.
H-C.14594, B.M.Cat.v, 466.

Serapion Senior [Yahyā ibn Serabi]. Breviarium medicinae.
297 × 203 mm. 149 f. Venice, Rainaldus de Novimagio, Kal. Aug. [1], 1479.
Hain 14693.

*Serenus Sammonicus, Quintus. Liber medicinae.
206 × 135 mm. 26 f. Without place, date or printer.
Hain 14698.

*Sibylla, Bartholomaeus. Speculum perigrinarum quaestionum.
197 × 133 mm. 264 g. Strassburg, Johann [Reinhard] Grüninger, 14 Kal. Sept. [19 Aug.], 1499.
H-C.14720, B.M.Cat.I, 113.

*Simon Januensis, a Cordo. Synonyma medicinae; Clavis sanationis.
281 × 205 mm. 100 f. Venice, Gulielmus Anima Mia, Tridinensis, 13 Nov. 1486.
Hain 14749.

*Sinthis or Synthen, Johannes. Composita verborum.
200 × 144 mm. 57 f. Strassburg, Johann Prüss, 1490.
Hain 5579.
B.M.Cat.I, 128.

*Soldus, Jacobus. Opus de peste.
200 × 142 mm. 36 f. Bologna, Johann Schriber, 1478.
Hain 14870. Osler 149.

*Spiera, Ambrosius. Quadragesimale de floribus sapinetiae. Edited by Marcus Venetus.
220 × 162 mm. 410 f. Venice, Gabriel de Grassis, 11 April, 1485.
H-C.921, Pell 601, B.M.Cat.v, 333.

Spregner, Jacobus and Institoris, Henricus [Krämer, Heinrich]. Malleus maleficarum.
220 × 166 mm. 146 f. Nuremberg, Anton Koberger, 17 Mar. 1494.
Hain 9245, B.M.Cat.II, 438.

*Suidas. Lexicon graecum.
358 × 241 mm. 516 f. Milan, Johannes Bissolus and Benedictus Mangius, 1499.
Hain 15135.

*Suiseth, Ricardus. Opus aureum calculationum.
263 × 183 mm. 85 f. Padua, [*ca.*1470].
Hain 15136.

*Sylvaticus or Silvaticus, Matthaeus. Liber pandectarum medicinae.
302 × 209 mm. 321 f. Vicenza, Hermannus Liechtenstein.
Hain 15193.

*Themistius Peripateticus. Paraphrasis in posteriora Aristotelis. Translated by Hermolaus Barbarus. Alexandri Aphrodisaei in libros de anima commentarii. Translated

by Hieronymus Donatus.
295 × 203 mm. 104 f. Venice, Johann Hamman, 4 Sept. 1500.
Hain 15465, B.M.Cat.v, 596.
This copy lacks the appendix, paged 1–14, containing Alexander Aphrodisiensis, De anima.

*Thomas de Aquino, In octo libros politicorum Aristotelis. Translated by Leonardus Aretinus. With conclusions of Ludovicus Valentia.
283 × 202 mm. 148 f. Venice, Simon de Luere, ult. [31] Oct. 1500.
Hain 1516, B.M.Cat.v, 576.

*Thomas de Aquino. Logica.
152 × 103 mm. f. without place, printer or date. [Leipzig].
Hain 1489.
Bound with: Armandus de Bellovisu, De declaratione difficilium . . . Basel, 1491.

*Thomas de Aquino. Opuscula.
245×176 mm. 436 f. Venice, Hermann Liechtenstein, 1490.
Hain 1541, B.M.Cat.v, 358.

*Tornamira, Johannes de. Clarificatorium super novo Almansoris cum textu Rhasis.
227 × 163 mm. 161 f. Lyon, Jean Trechsel, 17 June, 1490.
Hain 15551.

*Tortellius, Johannes Aretinus. Orthographia.
300 × 206 mm. 343 f. Vicenza, Stephan Koblinger, id. [13] Jan. 1479.
H-C.15566.

*Valescus de Taranta or Terenta. De epidemia et peste.
283 × 195 mm. 14 f. Basel, Martin Flach, [*ca.* 1474].
Hain 15244, B.M.Cat.iii, 741, Klebs 120.

*Valascus de Taranta or Terenta. De epidemia et peste.
200 × 139 mm. 13 f. Hagenau, Henricus Gran, feria quinta ante festum S. Katharine [23 Nov.], 1497.
Hain 15247, B.M.Cat.iii, 685.

Versehung von Leib, Seele, Ehre und Gut.
212 × 149 mm. 182 f. Nuremburg, Peter Wagner, 1489.
Hain 16019, B.M.Cat.ii, 463.
Contemporary binding of full stamped pigskin over wooden boards. Clasp intact. From the Monastery of Saint Peter at Saltzburg with book-label and classification numbers. The first printed book to have a universal book-plate. Beautiful floriated woodcut initials, and a full-page woodcut of a dying man.

Vicecomes, Hieronymus; Girolamo Viscomi or Visconti. Lamiarum sive striarum opusculum.
205 × 147 mm. 24 f. Milan, Leonhard Pachel, 13 Sept. 1490.
Cop.ii, 3210.

*Vincentius Bellovacensis. Speculum doctrinale.
346 × 238 mm. 268 f. Venice, Hermann Leichtenstein, 13 Jan. 1494.
B.M.Cat.v. 358.

*Vincentius Bellovacensis. Speculum naturale.
2v. v.1, 430 × 300 mm. v.2, 456 × 320 mm. 301 and 299 f. [Strassburg, Printer of the Legendae aureae, *ca.*1481].
Cop.6257, B.M.Cat.iii, 860.

*Vocabula pro juvenibus. F1^a Vocabula pro/ iuuenibus. F1^b Blank. F2^a De Celo./ F13^b [The End] Deo gracias. F14 Blank.
188 × 134 mm. 14 f. unnumbered. Sig. a8 b6. Gothic types, 33 lines, four columns. [Leipzig, Konrad Kachelofen, *ca.*1492].
Unrecorded.
Hirsch, 55, no. 380, 1930.

*Vocabularis rerum. [Brack, Wenceslaus]. Containing: Hugo de Sancto Victore: Didascalicon.
286 × 204 mm. 77 f. Strassburg, Johann (Reinhard) Grüninger, *ca.* 1486.
Hain 3697, B.M.Cat.i, 104.

Vocabularis rerum. [Brack Wenceslaus]
201 × 130 mm. 56 f. Augsburg, Johann Schönsperger, 23 Dec. 1495.
Folio 1, title missing.

*Vocabularius ex quo latinoteutonicus.
192 × 128 mm. 168 f. [Reutlingen, Johann Otmar, not after 1489].
J. Halle, Catalog 60, 1927, no. 144.
Rubricator has twice written the date 1489 on folio C6.
Fine contemporary binding of half calf stretched over wooden boards with clasp intact.

Zerbus, Gabriel. De cautelis medicorum.
185 × 129 mm. 16 f. Without place or printer, 1495.
Hain 16286.

*Zerbus, Gabriel. Gerentocomia.
194 × 134 mm. 134 f. Rome, Eucharius Silber, 27 Nov. 489.
Hain 16284, B.M.Cat.iv, 110.

CHECK LIST OF INCUNABULA OWNED BY THE LANE MEDICAL LIBRARY OF STANFORD UNIVERSITY, SAN FRANCISCO, CALIF.[*]

Aquino, Thomas de, *Saint*. [Opuscula.] [Venetiis, Hermann Lichtenstein, 1497.]
[436] ff.
Hain 1541.

Articella. [Venetiis, Hermannus Lichtenstein, 1483.]
212 ff.
Hain 1869.

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[*] Compiled by Linda tum Suden, Cataloger.

AVICENNA. [Canonis lib. III.] [Lugduni, Johannes Trechsel, 1498.]
2 v. [379, 357] ff.
Hain 2214.

AVICENNA. [De animalibus.] [N.p., n.p., n.d.]
54 ff.
Hain 2220.

BARBARUS, HERMOLAUS. [Castigationes Plinianae.] [Romae, Eucharius Silber, 1492–1493.]
2 v. in 1. [348] ff.
Hain no. 2421.

BARTHOLOMAEUS ANGLICUS. [De proprietatibus rerum.] [Nurnberg, A. Koburger, 1483].
[266] ff.
Hain 2505.

FICINUS *Florentinus*, **MARSILIUS.** [Epistolae]. [Venetiis, Matthaeus Capçasa, 1495.]
6 p l., clxxxxvii f., 1 l., [i.e. 204 ff.]
Hain 7059.

MANLIIS *de Boscho*, **JOHANNES JACOBUS DE.** Luminare maius. Cinthius vt totum radiis illuminat orbem. Illuminat latebras sic medicina tuas. Lumen Apothecariorum cum nonnul-lis expositionibus nouiter impressum. [Venetiis, n.d. (prior to 1490.)]
[1], 94, [4] ff.
Hain 10709.

REGIMEN SANITATIS SALERNITANUM. [Colonie, 1494.]
[75] ff.
Hain 13761.

RHASIS. [Opera, una cum aliorum medicorum tractatibus.] [Venetiis, J. Hertzog, 1500; B. Locatellus for O. Scotus, 1497.]
2 v. in 1. 112 ff., 48 ff.
Reichling 1854. Hain 13894.

SERAPION, *the elder, i.e.* **YŨHANNÃ IBN SARAPION** *known as* **SERAPION.** [*fl.* 9th cent.] [Practica.] [Venetiis, B. Locatellus for O. Scot, 1497.]
211 ff.
Hain 14695.

VERSEHUNG leib sel er vnnd gutt. [Nürnberg, 1489.]
[1], [9] ff.
Hain 16019.

[From Nüremberg Chronicle, 1493.]

BOOK REVIEWS

Benevenutus Grassus of Jerusalem, De Oculis eorumque egritudinibus et curis. Translated by Casey A. Wood, m.d., ll.d. Illustrated. Stanford Univ., Calif., Stanford Univ. Press, 1929.

Throughout the Middle Ages during a period of some five hundred years this work of Benevenutus Grassus was the most popular manual of ophthalmology. Dr. Wood gives a bibliography of it in which he lists twenty-two manuscripts and eighteen printed editions. It was printed five times between 1474 and 1500. The earliest known manuscript is a thirteenth century Provençal codex in the library of the University of Basel, of which Dr. Wood reproduces two pages from a photographic reprint. The claim that it was the first printed work on diseases of the eye has been disputed, some asserting that the *Liber de Oculo Morali* of John of Peckham antedates it. We think that Dr. Wood has proved beyond question the priority of the work of Grassus.

But little is known of the author. As is well known before the invention of printing the transcribers of manuscripts were wont to alter the names of the authors, whose manuscripts they copied in the most astonishing manner, and thus we find the work of Grassus turning up with the author's name given in anything but its real form. One of the deepest students of his work, Albertotti, thought that he should be known as Benevenutus of Jerusalem, because that is the "only name that, once employed, never varies in the various texts." The same uncertainty prevails as to the exact period in which he flourished. Wood, after careful weighing of the evidence, thinks that Grassus flourished in the eleventh century. Although he refers to himself as "of Jerusalem," if he was a Jew it has been suggested that he was an apostate as he advises the sign of the Cross, the recital of *pater nosters*, and other Christian procedures which he would not have done had he remained faithful to the Jewish belief. Wood, however, points out that Christian scribes were wont to interpolate Christian invocations or prayers in manuscripts of Arabian, Persian or Jewish origin; consequently their presence is not proof positive as to the religion of the author.

Wood thinks that after receiving most of his medical education at Salerno Grassus practised in the Near East and in several cities of Southern Europe, finally settling at Montpellier, where he wrote his book. He was famous for his skill in the treatment of diseases of the eye, and especially as an operator on cataract. He travelled widely and spoke Hebrew, Italian, Provençal and Arabic.

Anyone who has attempted to translate or even merely read a medieval Latin text will realize the difficulty of Dr. Wood's task and can appreciate the scholarly manner in which he has accomplished it. Although Grassus deals with many eye conditions we will single out but one passage, that in which he describes his operation for cataract, for special notice. Grassus first purged his patient, with "my Jerusalem pills," of which he gives the formula. The patient was then seated astraddle on a bench facing the operator. "So begins the operation in the name of our Saviour Jesus Christ." Grassus used a gold or silver needle in preference to one made of steel, because the latter was harder and heavier and hence apt to cause more pain, and was also more likely to break off and remain in the eye. Also, falling, as Wood says, into astrology, he maintains that "a gold instrument especially clarifies objects with which it comes in contact because of its inherent power over cold and dampness." The description of the actual operation is as follows:

> With one hand raise the upper lid, and with the other hold a silver needle and direct it toward the outer lacrimal region. Then perforate the eye coats, pushing and turning the instrument around with the fingers until you touch the diseased matter, which the Saracens and Arabs call *linzaret* (but which we call cataract), with the point of the needle, and dislodge it from its position in front of the pupil. Then push it well below, holding it there until you have said four pater nosters. Then carefully and slowly turn the needle back to its first position in front of the eye. If the cataract follows the instrument and shows itself in front, you must again depress it, pushing it this time as much as possible toward the ear. Then withdraw the needle in the same manner that it was inserted. And note well that having entered the instrument you must not withdraw it until you are convinced that you have depressed the cataract in the manner just described.

GREAT PAINTERS AND THEIR WORKS AS SEEN BY A DOCTOR. A Series of Monographs edited by Dr. J. G. De Lint. No. 1. Rembrandt. By Dr. J. G. De Lint. 64 illus., The Hague, J. Philip Kruseman.

If the succeeding volumes of this series are as well planned and written as the present they will form a valuable series of books on the social as well as the cultural aspects of medicine. Medical and surgical subjects were very popular with the old masters. The innumerable canvasses on which are depicted the various miracles narrated in the Bible, the sufferings of martyrs such as St. Roch and St. Sebastian and the visitations of the plague are familiar sights in all the galleries of Europe. Leonarda da Vinci and Michael Angelo were much more skilled anatomists than most of the anatomists of their time and have left many sketches and drawings illustrating their deep interest in the subject. Later, especially in Holland, paintings dealing especially with anatomical subjects were produced in great number by many different artists, of which the "Lesson in Anatomy of Dr. Nicholas Culp," by Rembrandt, is the most famous example. Dr. De Lint made a wise choice in taking Rembrandt as the first subject in this series of monographs for the reason that so much of his work touches on medical matters, and he has added greatly to the value of his study of the artist by the choice of illustrations for this book, and by his judicious and illuminating comments upon them. Chapter I deals with "Physicians and Quacks," and is especially interesting because of a careful study of Rembrandt's small etching "The Mountebank," in which the charlatan is holding a pair of spectacles in his hand which he is trying to sell, just as other itinerant opticians have done ever since the invention of spectacles. Chapter II deals with portraits of some medical men with interesting thumbnail sketches of their subjects. It is known that Rembrandt painted a portrait of Paracelsus but unfortunately it has disappeared since a record of its sale in 1676. Besides individual portraits the pictures of the physicians attending the "Anatomy Lecture of Nicholas Culp" have been identified. In Chapter III, "Anatomy" there is a delightful study not only of Rembrandt's various pictures of anatomical lectures but also of the origins of paintings of this kind by other artists. The picture of Culp demonstrating anatomy to a group of interested physicians is known the world over and is the most famous of all paintings of this kind. It was painted in 1632 and hung in the Hall of the Guild of Surgeons until 1828, when that body needing funds sold it to the King, by whom it was placed in the Mauritshuis at the Hague where it remains to this day. Even the unfortunate subject who is being dissected has been identified. In 1632 but one body was assigned for dissection, that of Adrian Adriaanz, otherwise known as "het Kind," or "the child," who was hanged for "Wantoness." There has been much discussion as to the anatomical correctness of the body in the painting, but Dr. De Lint, we think, proves quite satisfactorily that the somewhat swollen appearance of the body is due to the manner of death. The perforating tendons of the forearm muscles are depicted with wonderful accuracy. There is the most interesting remains of another picture of a dissection which was painted by Rembrandt in 1656. It was partially destroyed by fire in 1723. What is left shows the dissector, Dr. Deyman, minus his head, the dead body, and an assistant standing near the corpse holding the calvarium in his hand. This picture is now in Amsterdam. Chapter IV deals with "Internal Medicine," and Chapter V with "Miraculous Healings," both subjects which were frequently dealt with by Rembrandt.

The following chapters deal with Surgery, Ophthalmology, and Obstetrics.

This is a delightful book and in view of the way in which it has been planned and written may be said to open up a new field in medical literature. We anticipate with pleasure the succeeding volumes.

EDWARD JENNER AND THE DISCOVERY OF SMALLPOX VACCINATION. By Louis H. Roddis, Lieutenant Commander, Medical Corps, U. S. Navy. Menasha, Wisconsin, George Banta Pub. Co., 1930.

Beginning with a brief historical review of the prevalence and ravages of smallpox throughout the world before the discovery of vaccination, the author describes the practice of inoculation which was introduced by Lady Mary Wortley Montague from Turkey into England in 1721. Even such an imperfect method of protection as this afforded was hailed with acclaim throughout England and Europe, and was rapidly adopted in the British colonies in North America. Roddis reprints the pamphlet which Benjamin Franklin published in conjunction with Dr. William Heberden in 1754, in which the method of performing inoculation for smallpox and its great benefits were fully described. Although inoculation was better than nothing as a preventive measure it had certain disadvantages. The inoculated person suffered from a real attack of smallpox; he was capable of transmitting it to others, and there was danger of the transmission of syphilis by its means. Nevertheless smallpox contracted in this way usually ran a mild course, and was seldom attended by blindness or the terrible scars, which so frequently resulted when the disease was accidently contracted. The author gives a number of interesting statistics showing the terror of smallpox even after inoculation was generally in use. "In London during the decade between 1760 and 1770 there were 24,234 deaths from smallpox and 234,412 from all causes. The population of London was then about 650,000 so that approximately one-tenth of all deaths was due to smallpox and nearly 4 per cent of the whole population died from that disease alone during that decade."

Edward Jenner's life story has been well told by his contemporary biographer Baron, but much light has been thrown on his work and the steps leading up to it by later students of the subject. Jenner began his professional life as apprentice to a surgeon in a small town near Berkeley, but in 1769 he went to London and became a house-pupil of John Hunter. To the latter he probably owed much, particularly his training in observation and experimentation, and the caution with which he weighed all the facts before making any statement. It was not until some years after Hunter's death that Jenner published the famous little book in which he announced his discovery to the world. During all the years which led up to his final triumphant demonstration of the efficacy of "kinepox" as a preventive of smallpox, Jenner while working hard at such a difficult investigation, carried on an arduous country practice, and also found time to indulge in the study of natural history, particularly the migration of birds and hibernation of animals, and to write occasional poetry of considerable merit.

Jenner's book "An Inquiry into the Causes and Effects of the Variolae Vaccinae, a Disease discovered in some of the Western Countries of England, particularly Gloucestershire, and known by the name of the Cowpox," was published in 1798. Roddis gives an excellent account of its reception. Although there was some hostility to his views it is remarkable how rapidly they were adopted by the majority of the profession. Also it is gratifying to find the scientific discoverer receiving at least some of the reward due to his labors in his life time. He received two large grants from Parliament, and the sum of £7400 was raised by public subscription in various cities in India, and sent to him as a token of gratitude by persons living in that country. He died during an apoplectic seizure in 1823 in his seventy-fourth year.

It is a pity that this most interesting little book is marred by the carelessness with which it has been printed. Let us hope the numerous typographical errors will be corrected in a second edition.

FRANCIS R. PACKARD.

EARLY SCIENCE IN OXFORD. By R. T. Gunther. The Life and Work of Robert Hooke (Parts I and II). 2 vols. Printed for the Author, Oxford, 1930.

For some years Dr. Gunther has been engaged in publishing his valuable series of works on "Early Science in Oxford" and those who know them will welcome these additions. The work as a whole covers mathematics, chemistry, physics and the natural sciences. Many of the great group of scientists who worked at Oxford though chiefly known for their work in other fields contributed greatly to the progress of medical science. Christopher Wren, the famous architect, was a pioneer in the study of anatomy by the injection method and he and Hooke conducted experiments on "hatching eggs by the equal and moderate heat of a lamp," and Robert Boyle, the chemist, proved that air was necessary for combustion and life, thereby opening a path towards the correct knowledge of the physiology of the respiration. Robert Hooke was one of the most remarkable of the group of men who worked at Oxford and later united to continue their studies in the fellowship of the Royal Society in London. From an early age he manifested a genius for mechanics and mathematics. In 1653 when he was eighteen years old, he went to Oxford, where he worked as assistant to Thomas Willis in his chemical laboratory. Willis was another universal genius, whose work in anatomy is commemorated in the circle of vessels in the cerebral circulation which bear his name, and it is also connected clinically with his discovery of the phenomenon known as *paracousis Willisii*. Later Hooke became Robert Boyle's assistant and cooperated with him in the construction of his air pump. The Royal Society was founded in 1660 and in 1662 Hooke was chosen as its Curator, and until his death he was one of the most active of its fellows. Gunther's transcription of the many experiments and demonstrations which Hooke made for the Society is truly astonishing and of the greatest interest. Space will only permit mention of a few of Hooke's most notable achievements. In addition to the air pump which he constructed with Robert Boyle, Hooke invented the mainspring of watches and the anchor-escapement for clocks with pendulums. Gunther attributes to him the invention of the wheel-barometer, and it was he who suggested that the freezing point on a thermometer scale should be represented by zero. In their bearing on medicine his experiments in optics were of the greatest importance. In the Lewis Evans Collection now lodged in the Old Ashmolean Museum in Oxford there is a model of his microscope which illustrates some of the improvements he made on earlier models, and he improved the spectacles heretofore in use for the correction of vision. Throughout page after page of Dr. Gunther's book will be found records of experiments and inquiries made by Hooke in physiology, embryology and other branches of medical science. In 1665 he published his great book "Micrographia," one of the earliest and best works on microscopic technic. After the Great Fire of London, Hooke was appointed City Surveyor and as such had much to do with the rebuilding of the City. He was an architect of no mean ability. Gunther says, "As examples of Hooke's skill as an architect we may quote the new Bethlem Hospital, the College of Physicians, and Montague House, which became the British Museum. In 1691 he planned Alderman Aske's Hospital at Hoxton." Hooke had a peculiar personality. He was engaged in several bitter disputes on scientific matters, in which he showed the asperity which, however, characterized most of the scientific arguments of the time. One of these disputes with Oldenburgh, the Secretary of the Royal Society, was so violent that Hooke for sometime abstained from participation in the Society's affairs, only resuming his activities after the death of his opponent.

Like the preceding volumes of the "Early History of Science" at Oxford, this work of Dr. Gunther's is a most valuable contribution to our knowledge of one of the most brilliant periods in British science. The more one knows of the work and achievements of the scientists who worked at Oxford and London during the Restoration period the greater is the esteem in which they will be held. Gunther has for years worked on every aspect of the subject and his books are evidence of the ability and industry with which he has covered the field.

Francis R. Packard.

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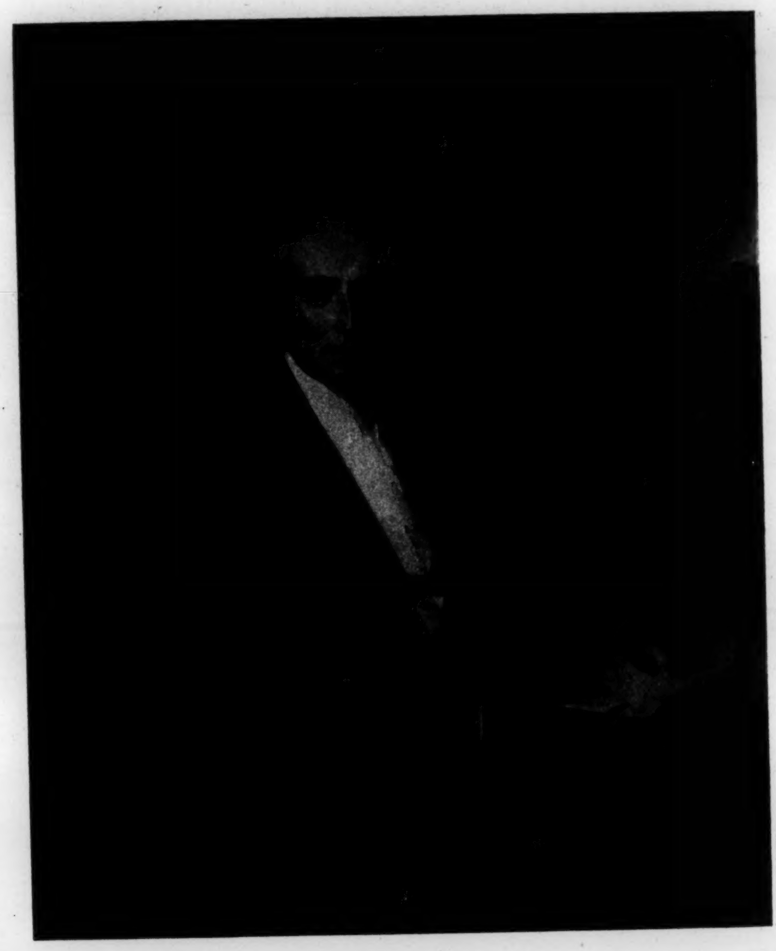

PHILIP SYNG PHYSICK
[1768-1837]